January 1987
Issue #316

73 Amateur Radio

USA $2.95
CAN. $3.95
A WGE Publication

Introducing The New DX Dynasty Award!
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Number 20 on your Feedback card

BALONEY

The newest excuse I've heard for why kids are avoiding amateur radio is that, gee, the kids today have so many things to do they are passing ham radio by as a hobby. I never heard such utter crapola in my life.

This song and dance is coming from old men who should know better. I guess they're suffering from advanced memory loss or something—well, I'm not. I remember quite well when I got involved with amateur radio and I had no shortage of things to occupy my time.

I first got started building radio equipment when I was 14 and I kept at it hot and heavy for almost twenty years. Not that I've slacked off my hamming all that much in the last thirty years, it's just that I haven't been building as much.

Amateur radio had a lot of competition for me—and I'll bet I get a couple hundred letters from other old-timers who suddenly recall that, heck, there sure were a lot of things to keep kids busy, even fifty years ago.

For instance, when I went to high school I joined the school radio club—W2ANU. But I also was quite active with the camera club—the book club—the choral club, where we rehearsed an hour every day and gave frequent professional performances—the Savoyards, where we rehearsed for months and then put on *The Mikado* (I played Koko) before the school assembly of about 10,000—plus I was a member of the Brooklyn Philharmonic Choir, with more rehearsals and concerts. And often in the evening I went roller skating all over Brooklyn with friends—went all over Brooklyn and Manhattan seeing two to four double-feature movies a week—dated girls on weekends—took weekly dancing lessons and went to dances—was a member of the Boy Scouts with a weekly troop and patrol meetings, hikes, and camping outings—bicycled now and then to New Jersey or Staten Island with friends—even did some homework. No, there was no shortage of things for a kid to do—and I wasn't all that much different from the other kids.

In college I joined the radio club (W2SZ), the Glee Club, the RPI Players, where I was the sound man, began building my classical record collection, built hi-fi equipment, was active in school politics, went to dances, dated, and so on. Oh, I bought my first car there and spent a good deal of time reworking my Model A Ford. I was also a supreme nuisance with my ham station and my invisible antenna wire strung across the freshman quadrangle, knocking out hundreds of cheap ac/dc dorm radios. They finally only allowed me to operate from 2 to 3 a.m., which was a great time for 160 meters.

I wasn't all that much in sports, but I got my varsity letter as a member of and manager of the fencing team—which meant many field trips to other schools for competitions. I also got darned good at swimming, bowled in the 180s, and spent many hours a week in the school darkroom developing and enlarging pictures. Tell me about kids today being too busy for hamming.

In the winter I went sledding in Prospect Park and ice skating in

Continued on page 10

"He says you just won a year's subscription to seventy-three magazines!"

This caption was contributed by Earle Post WA6ITG, who wins a one-year subscription for making us laugh. Thanks to the hundreds of readers who sent in their best knee-slappers.

QRM

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Subscription Information

Rates: in the United States and Possessions: One Year (12 issues) $24.97; Two Years (24 issues) $45.47. Elsewhere: Canada and Mexico—$39.00/1 year only, US funds. Foreign surface mail—$45.00/1 year only, US funds drawn on US bank. Foreign air mail—please inquire. To subscribe, renew or change an address: Write to Subscription Department, PO Box 931, Farmingdale NY 11737. Return postage guaranteed. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients. For questions concerning your subscription and to place subscription orders, please call us toll free at 1-800-227-1053 (in NY 1-800-732-9119) between 9 am and 4:30 pm Eastern time or write to *73*, Subscription Department, PO Box 931, Farmingdale NY 11737. ***73 Amateur Radio*** (ISSN 0745-080X) is published monthly by WGE Publishing, WGE Center, Peterborough NH 03458-1194. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Canadian second class mail registration number 9566. Entire contents copyright © 1987, WGE Publishing. All rights reserved. No part of this publication may be reprinted or otherwise reproduced without written permission from the publisher. Microfilm Edition—University Microfilm, Ann Arbor MI 48106. **Postmaster:** Send address changes to *73 Amateur Radio*, Subscription Services, PO Box 931, Farmingdale NY 11737. Nationally distributed by International Circulation Distributors. **Beware:** The mere reading of this contract between you and publisher Wayne Green is acceptable evidence of your total and unequivocal agreement to its terms. If you want out now, too bad. You have hereby agreed to the following: to totally support Novice Enhancement, to do everything in your power to get the ARRL to petition the FCC for a no-code license, to get your local ham club to sponsor school radio clubs in all area schools, to stop smoking, to embark on a serious diet if you're overweight so you won't contribute to the massive Silent Keys list in *QST*, to turn in your parents if they use illegal drugs, to make sure Wayne Green's talks at hamfests are packed, to build at least four construction projects a year, to use the Feedback card to vote on the articles, to send in the Reader Service card every month, and to buy at least three ham products advertised in *73* per year.

QRX . . .

EDITED BY PERRY DONHAM KW1O

Number 24 on your Feedback card

Peepers

HOW ABOUT giving your favorite ham rag a hand? We'd like to know where you're seeing *73* on the newsstands—and where you aren't. We're trying to make certain that everybody has a chance to get his own copy of the magazine each month (we've heard stories of postmen being mugged for their stash of subscription copies). Just jot down the name of at least one place you see **it**, and one place you don't, on a card and send it to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: Peepers. We'll draw a few cards out of a hat and give those folks a one-year subscription or extension to *73*.

Watts Shakin'

WHILE MOST HAMS worry incessantly about the weather, hams in southern California turn their attention to the ground, especially when it starts to move. To bring hams with earthquake interests together, the **Seismic Discussion Net** meets every Friday evening at 10:30 local time on the W6FXN repeater (145.460 MHz) near Covina. The net attracts professional seismologists, amateur tremor-chasers, and the curious. Topics range from the dissemination of earthquake data to the description of home-brew seismic detectors. Whenever a major quake strikes, SDN members collect intensity and direction information; the W6FXN repeater automatically transmits telemetry tones when seismic activity in excess of 3.5 on the Richter scale is detected in the area.

Gerli Gets It

ARRL DEPUTY AD MANAGER Sandy Gerli AC1Y was the big winner at our Boxboro convention party for industry members. A very surprised Sandy received a Technics compact disc player, and at last report was seen racing into a CD store waving his charge cards.

9N1 Update

KRISHNA B. KHATRY 9N1MC, Chief Engineer for the Ministry of Communications in Nepal, wrote in to say that he is active from Kathmandu from 0900–1400 UTC on 10, 15, and 20 meters (and sometimes on 40 and 80 meters). Krishna's QSL address is the Ministry of Communications, Panchayat Plaza, Prithvi Path, Kathmandu, Nepal. Krishna's office issues licenses for Nepal, and he says that the only official calls operating there are 9N1MM, 9N1MC, and 9N1RN. 9N1HCK was licensed to operate for only a few days from July 30th to August 4th, 1986.

Krishna Khatry 9N1MC, QRV on 80–10.

South Shetland

THE SAME GROUP that brought you Flores Island CV0U in December of 1985 now has permission to activate South Shetland Island CX0XY in February of 1987. The exact date depends on transportation to the site by the Uruguayan Air Force, but you should have no trouble finding the pileups on the HF bands. QSLs go to the Uruguay DX Group, Box 20063, Montevideo, Uruguay, South America.

VITA Men

VOLUNTEERS IN TECHNICAL ASSISTANCE is looking for someone to work for three months this winter in Ethiopia. The job involves cooperating with CARE and the Relief and Rehabilitation Commission to integrate packet radio with an existing two-way radio system operated by the RRC, and training RRC staff members to use the new setup. This is a paid position and starts in January; if you're interested, quickly drop a note detailing your basic qualifications to Gary Garriott WA9FMQ, Manager for Information Technology, VITA, 1815 N. Lynn Street, Suite 20, Arlington VA 22209.

No, Yes, Maybe

WE'VE GIVEN UP trying to report on the fate of OSCAR 10. First it's dead, then it's feeling much better, then it's gone again . . . the latest report says that beacons are beaconing and that the sun angle is improving, giving hope that the Internal Housekeeping Unit (IHU) may be able to be reset. If the IHU responds, and the ground controllers are able to upload programs to AO-10, the satellite may again become usable. It's expected that the satellite will be running with 100% power as you read this, so keep an ear on the beacon at 145.8090 MHz.

Space Space

FROM *THE W1FN BULLETIN* (West Lebanon, New Hampshire) comes word that a limited amount of time will be available on the Hubble Space Telescope to amateur astronomers. Projects must have a clear scientific or educational value. Information and application forms can be had for $1 from HST Amateur Astronomers Working Group, c/o AAVSO, 25 Birch Street, Cambridge MA 02138. The deadline for completed applications is March 31, 1987.

Wayne, in a move to appease the League, bribes the ARRL's Sandy Gerli AC1Y with a free CD player.

Heard Again

IF YOU MISSED the last expedition to Heard Island, take heart. Jim Smith VK9NS, in a letter to *Long Island DX Bulletin* Editor Harvey McCoy W2IYX, said that the scientific expedition's meteorologist is a ham and plans to be on the air until about January 21st. This operation, combined with the recent very successful ventures, may put Heard permanently off the most-wanted DX list. Jim also mentioned that he is working on an expedition to Mellish Reef and Willis Island, possibly running in the first quarter of 1987.

Free Islands

A FREE MAP of the Pacific Islands is available from the Department of Planning and Economic Development, PO Box 2359, Honolulu HI 96804. Ask for the map titled "The New Pacific." (Thanks to the *BIARC Bulletin*.)

Dr. Destructo

$65,000 WORTH of illegal CB radios and amplifiers was destroyed by FCC Field Engineers recently in San Francisco. The equipment was taken from CB stores and private individuals who gave up the gear rather than face prosecution. Earlier, the FCC had seized equipment valued at $35,000 from Suburban Electronics of Fairfield, New Jersey, and two individuals, Larry Wallach and Gerard Purnhagen of L.W. Sales, received probation and fines totalling $12,000 for importing and marketing illegal CB radios. The commission has determined that 57% of the complaints of interference to electronic entertainment are the result of CB radios running over the legal output.

73's Art Director Dianne Ritson takes a coffee break during the shooting of last month's cover (photo by Dave Leifer N2ESS).

New! Improved!

NEW THIS MONTH in *73* is our column covering amateur satellites, appropriately titled HAMSATS. Andy McAllister WA5ZIB will be keeping us up to date on all of the crazy things happening in the world of space radio. The improvement is to the ARRL's DXCC program; page 27 carries the announcement of our very own **DX Dynasty Award (DXDA)**. We've come up with nearly 400 countries to work, with an incredible variety of endorsements. The best part is that *everybody starts with zero countries on January 1st, 1987!* There'll be head-to-head competition between the DX neophytes and the Honor Rollers, at least for a few weeks.

JA Recip

CANADIAN AMATEURS are now eligible for reciprocal Japanese ham licenses according to an agreement that took effect on November 16, 1986. Japan also maintains reciprocity with the United States and West Germany. Canadian hams should contact the CRRL for specific information.

Listo!

MANY THANKS to the *W5YI Report*, *The Westlink Report*, and *Amateur Satellite Report* for help with this month's column. And from Wayne, Stu, Perry, Chris, Robin, Richard, Di, Steve, Jim, Nancy, Hope, and everyone else here at *73*: Happy New Year!

NEVER SAY DIE

from page 4

both Central and Prospect Parks. When the snow kept us from roller skating on the streets of Brooklyn, we'd take our sleds, sneak out at corners when cars would stop, grab their back bumpers and take rides. Sometimes we'd set a destination—say Coney Island, about six miles away—and we'd see who could get there first. This was usually at night so the drivers wouldn't see us.

Let's see, we also put on *The Pirates of Penzance* (I was the Major General)—plus I occasionally would sing solos in assembly—which was nerve-wracking, even though I was taking voice lessons. Well, you get the idea—we kids had an enormous number of things to occupy our little minds, even back in those prehistoric times fifty years ago.

Amateur radio had to offer a lot since it was up against girls, dances, skating, sports, plus over 120 after-school activities in my high school. There was even a music appreciation club which I attended now and then, but that didn't keep me from building ham receivers and transmitters, test equipment, and audio gear.

I even listened to the radio—Bob Hope, Fred Allen, Jack Benny, and other popular shows.

No, we can't blame computers, CB, TV, MTV, or even drugs for robbing amateur radio of youngsters. It's the lack of school radio clubs—almost all of which blew away in the mid-60s when the Incentive Licensing proposal killed 'em, just as it almost killed the whole hobby and almost every ham manufacturer. While this is obviously no reflection on the current ARRL management, that was certainly the worst miscalculation by the League in ham history. I said it at the time and boy, do I hate being right.

If we want to get amateur radio growing again—if we want to get kids interested—we shouldn't sit around telling ourselves lies to excuse the stupidity of a generation ago. We can thank Mort Kahn W2KR for that debacle—and he's dead now. Though he was only the Hudson Division Director, he actually ran the League from that position and made all of the major decisions for the directors.

I don't see much use in trying to interest kids in amateur radio if there aren't any school radio clubs to help them get their licenses once that interest is fired. Once we have school clubs we can get busy with ham articles in magazines—ham TV promotions—ham shows in malls, and so on. Once we get kids interested we'll find they have all the time in the world for something they want to do—just as we did. Also, it'll be a whale of a lot easier to get kids into hamming if we don't try to jam Morse code down their throats.

I first started seriously questioning the validity of the code test in 1956—thirtieth anniversary. I haven't made much headway yet, have I? In all that time I haven't heard one reason for the code which makes sense to me. Sure, I've heard every rationalization possible—heard 'em thousands of times. And I've shown these arguments to be hogwash. But I still hear 'em—mostly from old-timers these days—and not nearly as often, so perhaps we do have progress, as slow as it has been.

I'm still getting an occasional letter from an old-timer who I suspect has been living in a cave for the last twenty years, completely out of touch with the world—or maybe just reading *Brand X*, which is about the same. These accuse me of wanting more hams so I'll have more subscribers to *73* and fill my money-grubbing pockets with wealth.

You won't find one single study of entrepreneurs which says they've any serious interest in making money. You aren't going to find anyone more entrepreneurial than me—I'm the same as the rest of 'em—money is just something I need to get things done. It's never been of any importance in itself. I've always worked very hard because I enjoy it and I've always been frugal—still am.

So let's stop making excuses for sitting on our duffs letting amateur radio gradually evaporate. Let's get busy starting school radio clubs—in grammar and high schools.

Talking about evaporating hams, in case you don't get *QST*, the Silent Keys column is no longer a couple inches long, the way it used to be. It took a full page in the November issue. And I mentioned that a recent *73* mailing bounced back over 12% of the FCC ham list as deceased. We've been losing hams far faster than the FCC has recognized. Plus the number of new hams dropped 8.5% last year, up from a 7.9% drop in 1984.

No, if amateur radio isn't growing as fast here as it is in Japan, where they've issued over two million ham licenses, it's because we're all sitting around hoping someone else will do something. There are no more excuses.

FOX HUNTING

Old-timers will fondly remember going on hidden-transmitter hunts. Fox hunts, as they're called in Europe, are a ball, but they tend to appeal more to younger hams—perhaps because it can take some physical

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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work and thus is too much for fat old men who've almost destroyed their lungs smoking.

Fox hunts are one way we can make amateur radio more attractive for youngsters. I'll bet it was 25 years ago when the Philmont Club made movies of their fox hunts for other clubs to borrow. They were such fun to watch that I still remember 'em.

Kids can get extra fun from fox hunts by making their own directional antennas and detectors. I'll bet there are still some old-timers who have fox hunting gear around in a closet. How about blowing off the dust and writing an article on your design so we can lure kids into making a copy and getting involved with hunting.

Ham clubs could do a lot worse than set up a fox hunt once or twice a month. At first you have to make it easy, but as your hunters get wise to the usual tricks, you try to stay ahead of 'em.

I'm open for articles on fox hunting—how to make the fox hard to find—how to find a hard fox—the best equipment to use—and so on. All this practice suddenly comes in handy when someone jams a repeater or there's a stolen rig on channel.

Since hunters don't have to have a ticket, you might even get kids interested in joining your club hunts. Check with your local Scout group or 4-H Club and see if there are some kids who might be interested.

MORE FOOT SHOOTING

Too bad you weren't on the Asian electronic show tour with me this fall so you could have taken advantage of the windfall the U.S. has handed entrepreneurs. There will be a lot of instant millionaires this winter.

It has to do with protectionism, the fast fix politicians use to fight foreign competition, that without fail ends up making the situation worse. In this case the American chip industry got upset because the Japanese were making chips cheaper and better than they could, so they got Congress to legislate a minimum price on 'em. Memory chips which were selling for about $1.75 will now have to cost $8. Since computers are using these by the dozens, this would subtantially increase the manufacturing cost of American-made computers.

The answer is to move manufacturing to Asia and send over completed memory boards. This can be done without the minimum fixed price, so that's the end of making memory boards here. I'll bet there's going to be a rush of American computer firms to Asia to keep from being put out of business by this foolish new law. Congressmen aren't going to be happy until they chase every remaining shred of our electronic manufacturing offshore.

Well, that solves the problems we're having in getting kids interested in high-tech careers. If we get out of electronic manufacturing and service we won't need engineers and technicians.

Say, speaking of kids, did you know that over 50% of the graduate engineers in America today are foreigners visiting here for their education? Yep, less than 50% are Americans.

We CAN change this trend—this slide—by getting school radio clubs going. If your club has some success with this I'll pass the word on in *73* and that'll get other clubs going—we really can do it.

ARE WE REALLY WORTH OUR SALT?

Recently Bob Foosaner, Chief of the FCC's Personal Radio Bureau (just retired) valued the amateur VHF/UHF bands for commercial uses at as much as $300 billion. That comes to around $2 million for each and every active American amateur. I wonder how soon we'll see an attempted takeover by Carl Icahn? I'll bet he could buy the whole works for $10,000 per ham and make billions.

"50% of the graduate engineers in America are foreigners."

With microchips going into an ever increasing number of products, the loss of this industry to Japan is sure to have long-range problems for us both with civilian and military electronic equipment. Just look at the electronic equipment around us today—telephones, facsimile, copiers, VCRs, video cameras, microchips in cars, security, electronic locks. We're importing over $200 billion in electronic equipment now and that's supposed to keep increasing by about 30% a year for the next 15 years. Chips are the heart of electronics, as the Japanese have figured out.

If America isn't going to lose more and more high-tech industry to Asia, we're going to have to get serious about this. We need a couple million more electronic engineers and technicians than we have now. We need some serious help from the government to make our tax and government regulation systems support high tech instead of chasing it out of the country.

Amateur radio has been sliding downhill in America for twenty years and all I've seen so far in an effort to stop the slide is a comic book. I'm reading newsletters from over fifty ham clubs around the country and I can't remember one which has encouraged its club members to work together to do something about the loss of our hobby. In most it's business as usual. . . club meetings, gossip, a hamfest, an auction.

The fact is few hams have even a slight appreciation of the value of the bands we are using—or worse, not using. How long do you think the FCC is going to save these incredibly valuable bands for a bunch of selfish old men who won't even bother to get kids interested in their hobby?

A ham at the recent Minneapolis Hamfest said he saw the old-timers who helped the ARRL kill the no-code effort a few years ago as sitting in a lifeboat, stamping on the fingers of those trying to get in. Interesting simile.

Fred Maia, in his *W5YI Report* for October 15th, quoted Tony England WØORE on the subject of Morse code. The FCC regulations call for an Extra-class license to operate from space, so every astronaut ham so far has had to get a waiver from the FCC to operate. Said Tony. . .

> It is not required that astronauts know the Morse code. It is not very important for an astronaut to know the Morse code.
>
> I think astronauts should be amateurs to use the amateur facilities from space. There should not be any special permission that allows them to operate on amateur frequencies without being amateurs. I know of no earthly reason. . .or "spacely" reason for that matter. . .why an Extra-class license should be required, however, to transmit from space.
>
> I think the code is an important communication mode, but I don't really believe it should be so central to amateur licensing. I plan to get an Extra-class license when I get my code speed up. I enjoy CW, but it is hard to find the time to do it. When I worked HF I did about half CW. I would be in favor of having part of the [ham] bands digital or code and preserving parts of the bands that different classes could use without code knowledge.
>
> I am concerned about the importance that the amateur community places on an Extra-class license and the perception of incoming amateurs of that importance. If I am a new person starting and I know a lot about electrical engineering and everyone is telling me that the highest honor in amateur radio goes to someone who can send code at 20 words per minute, I would begin to wonder where their priorities are. What is this amateur radio really about?
>
> I think there ought to be alternate ways that if someone excels in certain areas that are recognized as important to amateur radio and can demonstrate that through an exam. . .or whatever. . .they should earn the high honor of being an Extra. If it is important to limit certain parts of the band from certain kinds of communication. . .well that is not involved with licensing, that is involved with what technique you use on what part of the band.

How many more youngsters would we get with a no-code ham license for operation, say, on 220 MHz? We don't have any idea. But we have so little to lose by trying it and so much to gain—such as the possible saving of amateur radio—that it's worth a try.

CANADIAN NEWS

The Canadian Radio Relay League has been cut loose from the ARRL at long last. Will this allow Canadian amateurs the freedom to get amateur radio growing in Canada? The CRRL dues now stay in Canada, with the CRRL buying *QST* for its mem-

bers and having it sent to them from the U.S.

The CRRL now handles its own membership records, handles its own finances, maintains its own offices and paid staff, etc. They're also breaking with ARRL tradition in looking into a new class of membership which will not include *QST*. This is due to the very high cost of *QST* in Canada, which they feel cuts seriously into their membership potential.

Negotiations are underway for a merger of the CRRL and the CARF, with the two being reborn as The Radio Society of Canada. With these remarkable changes, the purposes of the CARF would seem to have been achieved, so perhaps the two can now merge. This would provide Canada with a single strong organization which could then devote its energies to building the hobby in Canada.

MINNESOTA

They had a great little hamfest in Minneapolis in November—too bad if you missed it. Perhaps, if you're within driving distance, you can organize yourself and your family to make it next time.

The hamfest is on Saturday, so if you do some planning ahead you might also be able to get over to the *Prairie Home Companion* show in St. Paul. The hamfest ends up at 3 p.m., leaving you plenty of time to putt on over for the show by 5 p.m.

You'll hear why *Lake Wobegon Days* has been on top of the book list for a year now as Garrison Keillor spins his yarns. You may get like me and not only tape his stories every week, but buy his cassette yarns, too. If you haven't read the book, do it. Unless you have a special problem, you'll love it. I realize from my mail that we do have some hams who are angry people—who must be hell on wheels with which to live. I wince when I get an abusive letter from people who must be terrors to be around. I'm sure they don't single me out for their abuse.

Now, back to the Minneapolis hamfest which was held in a school in Richfield. It was just about right for the ham dealers and computer stuff exhibitors—plus they had a good large room for me to talk in. I'd judge there were maybe a couple thousand attending the hamfest—which didn't crowd the place too badly at all. I was disappointed to listen on 2m and hear many hams who weren't bothering to go to the hamfest. I'd sure like to see a hamfest some time when every live ham within easy driving distance made it his or her business to be there—like in the old days.

While I was there I recorded five interviews for *Gizmode*, a high-tech program which airs at 7:30 a.m. (yawn) Sunday mornings on KSNE (1280 kHz). You might want to check this out if you're in the Minneapolis area on Sundays. It's also on the K-SAT satellite radio network.

I'm planning on getting down to Orlando in March and I expect every ham still able to get out of a chair to be there to say hello. I expect I'll be speaking, too, so on the off chance I have something of interest to say, allow some time. Okay? Sometimes I'm pretty good. Sometimes I ain't. You take your chances. If you come and just sit there dozing off, so will I. If you come loaded for bear, we'll have a great time.

The Minneapolis crowd was semi-alive, so it wasn't a total loss. I brought along an 8mm video camera, so we've got it on tape. I'll try to tape my next couple of talks in Dallas and Las Vegas—combining the three I may end up with something to send out for club meeting entertainment. . . or punishment.

Hamfest chairmen, your biggest challenge is to get your local hams off their fat butts. Can you figure out something so great to do at your hamfest that they'll shut up on the local repeaters for a couple hours and mosey on down? Good luck.

If local dealers loaded with ham gear bargains, tech sessions, and prizes won't budge 'em, you've got some brainstorming to do. We don't have many well-known hams these days, so it's difficult to bring in headliners to talk. Barry's busy most of the time. I'm pretty busy, too. Which leaves an astronaut or two. . . Tony and Owen. Beyond that. . . ?

I'm doing the best I can to get to hamfests, but I'm spread far too thin. So far this year I've talked at Miami, Orlando, Atlanta, Dallas, Garland, Las Vegas, San Diego, Dayton, Minneapolis, and Boxborough. Get off my back! I have to do some work, too, you know. ■

LETTERS

Number 18 on your Feedback card

WB8DQT FAN

I was just about to drop my *73* subscription when along comes WEATHERSAT—great! For me this makes *73* a great ham magazine again. I can hardly wait for the next issue.

Dale Hauck, M.D. W6YFT
Los Angeles CA

IN THE AIR

I am not a ham yet but some day I would like to get my ticket. I have a mental block (or is it constipation?) of the brain keeping me from mastering the code. Theory should be no problem, as I'm an Avionics Communications Specialist in the Air Force and I get to work on HF, VHF, and UHF equipment—not only on the bench, but in aircraft installations.

The people that I work with think that I'm crazy for being into radios so much. I love it and can't get enough experience or my fill of the stuff. My wife is into cameras and computers, and together I know we could both have a blast being hams. I'm also trying to get my kids interested and expand their horizons. The day that I brought a Kenwood R-2000 home and hooked it up my boys were glued to it. It made me feel like a million bucks when I found out that they sneak in and listen to it. Just like my daughter, who gets out my code-practice oscillator and plays with it. It would be great to have five callsigns at this QTH!

An even bigger influence is the fact that I'm stationed at Yokota Air Base in Japan, with my wife and kids here also. Ham radio is "in the air" over here. Yokota is located by the city of Fussa-shi, which has a train straight to Akihabara! If the yen ever straightens out, I hope to go there often. I'm looking forward to that day.

Robert Aldridge
APO San Francisco

Robert, I just don't buy the excuses I hear from people about why they can't learn Morse code. You and everybody else in your family are physically and mentally capable of learning it... but you have to actually work on it. I've found that most folks who complain that they can't learn code expect it to just "happen" in their mind immediately, without effort. And that includes the "strugglers" who agonize over every new character—they are so embarrassed that code isn't easy that they spend all of their time worrying about their ego instead of just learning the letters.

So, my advice to you is to stop worrying that you can't learn the code. Of course you can learn it. Everyone can. Relax and work on it a bit at a time. Have a beer while you're listening to a code tape, or take a nice hot bath. If you can stop being so uptight about not being able to do it, you'll be amazed at how quickly you'll pick it up.—KW1O.

WAXING

I've just received my first issue of *73* (October) on a new subscription. I read this issue from cover to cover and have never found *QST* to be as interesting. I am so glad that Wayne is back that I felt obliged to write you this note to tell you so.

My interest in ham radio has been on the wane these past few years and, as such, I have not been too active. I look forward to the following issues of *73*, and for the renewed interest in amateur radio I thank you.

Bud Lieberman WB2WSZ
Hackensack NJ

De nada.—Eds.

RENT-A-WAYNE

I just heard your excellent talk in San Diego, Wayne. I wish more clubs could afford to hire you to come and talk to them. Maybe you should make a tape and rent it or loan it to clubs to get them stirred up!

Gib Gibson W7JIE
Renton WA

You're right, Gib, a video just might help. I'll try to tape my next couple of talks and see if anything useful develops which could be made available for clubs. I've got a couple of VCRs so I can make VHS copies of my 8mm tapes.

I got a letter from one admitted Wayne Green hater who wrote to say that he saw a video of my talk in L.A. and hated that too!—Wayne.

TRULY DOOMED

I just picked up the September, 1986, issue of *73* and read Never Say Die. I was very disappointed and ashamed of the image you presented of a ham radio operator. In the first place, I fail to see what a discussion of one's personal success has to do with ham radio. It is very disappointing to see that you apparently measure a person's success by the dollars he or she makes—the car one drives or how much one is willing to fork over for a subscription to your magazine. How absurd.

I am fairly successful in your own warped terms. I do, however, have many friends who are not as financially well off, but who are no less a success. Many people work very hard and contribute a great deal to society and/or the country and are not fairly compensated. Soldiers give their lives for an embarrassingly small salary.

If you truly believe that you can't consider a person successful if he/she can't spend the bucks to subscribe to *73*, then that is a sad statement of your character as a ham and as a human being. Ham radio should not be a hobby with a financial prerequisite. It should be for anyone who has the drive to get the license and who will promote the goals and principles upon which the hobby is based. One of the goals you have forgotten in pursuit of the dollar is goodwill. If you represent the future of ham radio, we are truly doomed.

Norman Joe Korpela
Portland OR

Apparently 20-wpm code has zapped your brain. When you suggest that someone, who may be a lovely person but who is so out of step with our society that he/she is starving to death, be considered a success, we do have a religious dispute. I've never had any personal interest in money, but I'm not dumb, so I've come to grips with the fact that my businesses have to be profitable if I'm going to start more of them—providing more people with work. Nowhere in my editorials will you find me suggesting that everyone should sacrifice themselves to get rich, but you will find me urging every reader to go into business so he/she will be able to buy the things he/she wants—such as ham gear, an occasional DXpedition—even a subscription to 73. Norman, give up the code before it gets worse. —Wayne.

TOO MANY

Much is being said these days about the need to liberalize the requirements for an amateur radio license. I say that the amateur service is fast becoming worthless to all of us due to the enormous number of licenses granted by the FCC! This fact is very obvious on the HF bands where intense interference is commonplace; too many stations are trying to fit into a finite spectrum.

Here are some alarming facts that you must be aware of: In 1971 there were about 250,000 hams. Today there are almost 500,000 (good statistics to show publishers of ham radio magazines who say the hobby is in a state of demise). And there are more Extra- and Advanced-class operators than all the other classes put together! The FCC should reduce the number of licenses granted by increasing the technical requirements for a ham ticket.

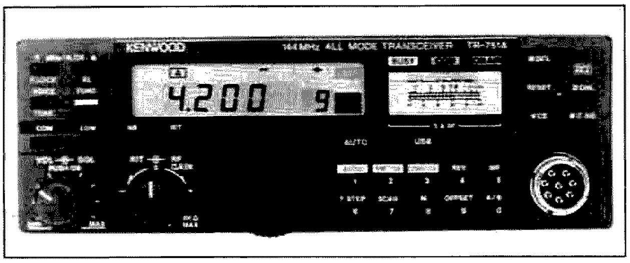
David Danello WB4ONS
Blacksburg VA

David, it's pretty obvious that you don't know what you're talking about. My guess is that you're using a junky receiver which you don't know how to use in the first place. If you're so hot for wide open spaces, try 10 meters—although I've heard some openings up there during the day which certainly sounded like a crowded band. You could always disconnect your antenna and listen to receiver noise.

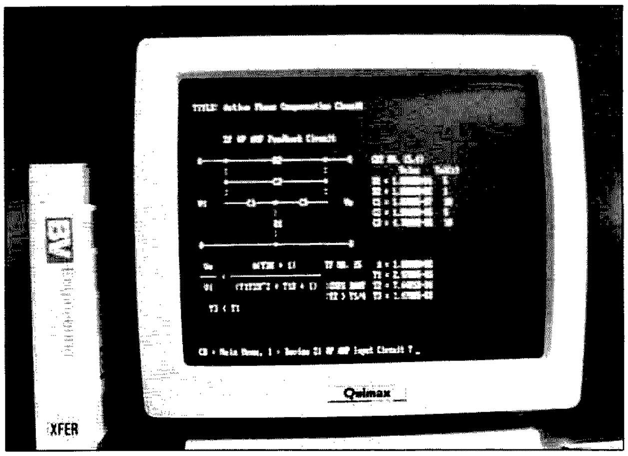
As for you alarming facts, here's what's really happening: There are just over 423,000 hams, not 500,000. If our research is correct, about 10% of the hams in the FCC computer are dead, so figure there's around 380,000 living amateurs. There are roughly 140,000 Extra- and Advanced-class licenses outstanding, and the rest combined total around 280,000. Last month saw 0% growth in the ham ranks, and it'll stay that way until we have a working no-code license in place.—KW1O.

NEW PRODUCTS

Number 21 on your Feedback card



The Kenwood TR-751A.



XFER transfer function analysis from BV Engineering.

KENWOOD TR-751A

Kenwood's newest two-meter all-mode mobile transceiver offers 25 Watts of output from 142–149 MHz (modifiable to cover 141–151 MHz), automatic mode selection, a GaAsFET front end, 10 memory channels, all-mode squelch, dual digital vfo's, and semi-break-in CW with a sidetone. Options include Digital Channel Link, a VS-1 voice synthesizer, and a 38-tone CTCSS encoder.

For more information, visit your local Kenwood dealer.

SCHEMATIC HELP

The fourth edition of *How to Read Schematics* by Don Herrington is now available from Howard W. Sams. The new edition has been revised to include logic diagrams and flowcharts. The book moves from a general overview of electronic diagrams to the specific components of a circuit, detailing the techniques used to follow complicated schematics.

How to Read Schematics retails for $14.95 and can be found in most bookstores; for information about this and other Sams books, check Reader Service number 205.

BVE XFER

BV Engineering has released a transfer function analysis and synthesis program for the IBM PC and compatibles. XFER uses short-circuit transfer impedance functions around an op amp to compute circuit elements and configurations to yield a given transfer function. The program will also calculate a transfer function given the values of the circuit components.

XFER is menu-driven and uses free-format input. Files generated by XFER are compatible with other BV Engineering programs such as **SPP**, PCPLOT, PDP, and TEKCALC. XFER files can be used as an input to SPP to perform transient and time-domain analysis of user-generated waveforms.

For more information on BV Engineering software, check Reader Service number 215.

REPEATER DEMO TAPE

Advanced Repeater Controls has introduced a new audio cassette which describes and demonstrates their repeater control products. Included in the demo are the RC-850 and RC-85 repeater controllers, the ACC Digital Voice Recorder, and the ITC-32 Intelligent Touchtone™ Control board.

The tape is perfect for club presentations and is available at no cost directly from ACC. To request a copy, contact ACC, 2356 Walsh Avenue, Santa Clara CA 95051; (408)-727-3330.

DISH INSTRUCTIONS

A new book from Power Gain Systems, *Build Your Own Satellite Dish Antenna*, gives step-by-step instructions for constructing a 10-1/2-foot dish antenna—including photos, illustrations, and sources for materials.

The book is $12; for complete details, check Reader Service number 207.

COMPACT VOM

Mercer Electronics, a division of Simpson Electric, has announced

PRODUCT SPOTLIGHT

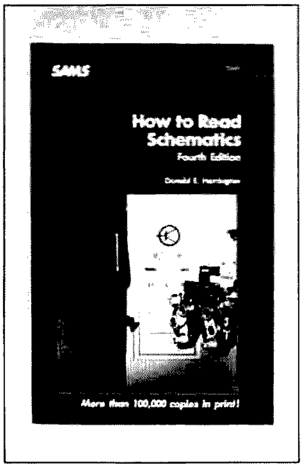
Here's our favorite new offering this month:

KANTRONICS KAM

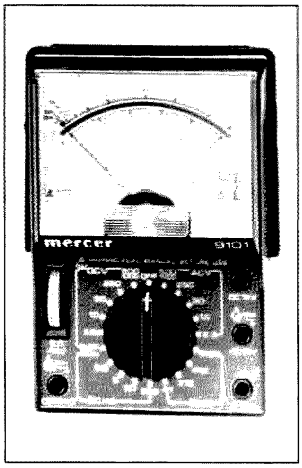
Kantronics has introduced KAM™, an all-mode digital communications interface. KAM is a radio modem with RTTY, AMTOR, packet, ASCII, and CW built in. The unit is compatible with any computer that has an asynchronous I/O port.

KAM features over 100 software commands, a bar-graph tuning indicator for RTTY and HF packet, a switchable limiter, programmable center frequency and bandwidth for CW, two radio ports, and programmable mark and space tones for RTTY.

For complete details, visit your local ham store or check Reader Service number 212.



Schematic-reading help from Sams.



Mercer's model 9101 pocket DMM.

73 Review

ICOM 751A

by Marc Stern N1BLH

ICOM America, Inc.
2380-116th Avenue NE
Bellevue WA 98004
Price class: $1,649

ICOM has always had a sensible new-equipment policy: Never release a new rig until the lifespan of an older model is finished. This policy has probably saved the sanity and marriage of more than one operator because the cost of a new rig can be spread over several years before a new version hits the market.

Considering this, then, you can imagine my surprise when the improved IC-751A appeared in ads, superseding the current IC-751 as ICOM's top-of-the-line rig. After all, the 751 was introduced about three years ago and seemed to still have some life left. So, you can also imagine my desire to get my hands on the newer version to see if the rig has changed.

Comparison to the IC-735...

After using the 751A for an extended period, I can say that there are some changes. The 751A is built upon the technology of the 735 (reviewed in November, 1985) to create a virtually new rig.

You really wouldn't think the 751A is a new rig from the outside because it looks just like the older 751, right down to the 35 knobs, control switches, and buttons on the front panel. It also has the same 105-dB dynamic range, continuous receive coverage through 30 MHz, multimode (AM, FM, CW, and SSB) capability, nearly the same LED display (with a couple of additions), and 100 Watts of output power.

But, if you were to continue thinking like that, you would be making a mistake. The new 751A has more in common with ICOM's other state-of-the-art rig, the 735, than it does with the older 751. In fact, comparing the schematics shows that with the exception of a couple of integrated circuits, the 751A and 735 are just about the same. The key difference in circuitry is that the customized microprocessor in the 735 controls a multifaceted liquid crystal display (LCD), while the 751A uses a multicolored light-emitting diode (LED) display.

Both radios take advantage of newly developed central processing units for control. This means the 751A is highly versatile, like the 735. For example, the new CPU allows monitoring of all 32 memory channels or only those storing a particular mode—FM, for example. Further, the programmed scan feature allows scanning between any two programmed frequencies. In all cases, though, the auto-stop feature of the 751A halts scanning until a QSO has finished and then automatically resumes when the frequency is clear.

This is like the 735's capability. The chief difference between the two is the fact that the 751A has 32 memories and two vfo's, while the 735 has 12 memories and two vfo's. The 735 also has an internal fan and no heat sink, while the 751A has a huge heat sink and an external fan.

In fact, the 735's fan comes on after a short time of heavy use, while the fan in the 751A remains off. This is due to the size of the heat sink. Further, the 735's fan is variable, meaning that the higher the demand, the higher the fan speed. This makes the 735's fan obtrusive at times in a quiet shack. The fan on the 751A, on the other hand, is quiet and only comes on when needed. In fact, it's barely noticeable under most circumstances.

...And to the IC-751

To be fair, though, the real comparison should be with the older 751, the rig that the 751A replaces. The key difference between them is important—program storage. As for other specifications, they are pretty much the same. For example, the new 751A's dynamic range is 105 dB, as is the 751's. The power requirements are the same—13.8 V dc; the usable temperature range is the same—14 to 140 degrees F; the display resolution is the same—to 100 Hz; spurious emissions are down more than 60 dB, as well as having harmonics down more than 40 dB; sensitivity is better than 0.5 uV; and selectivity is better than 2.3 kHz for SSB, CW, and RTTY at −6 dB.

The specifications, then, match them well. But, the two 751s are different. In the 751, ICOM used dynamic random access memory (DRAM) to store program and frequency information. The DRAM was backed by a lithium battery, whose average life was figured at about five years. Once the battery died, the programming disappeared due to the loss of power to the memory, and the rig had to be sent back to the factory for reprogramming. Just about all the older ICOM microprocessor-controlled models used this plan.

Evidently, ICOM has seen the light because it now stores its programming in nonvolatile memory. The only volatile memory is user memory, which contains the frequencies you've programmed as well as the modes. The lithium battery now backs up this user scratchpad. It's quite an improvement and shows that ICOM is willing to listen to consumer input.

Improvements

Looking at the 751A you wouldn't think anything has changed at all. The reason, quite frankly, is that the boxes look alike. However, when you look closely at the front panel, you begin to see some of the changes that have been implemented. For example, the 751A is an improved CW rig. It now sports an electronic QSK keyer that is capable of up to 40 wpm. It also has a standard 500-Hz CW filter and a CW sidetone monitor, so you can monitor your code in transmit and receive.

Another improvement over the 751 is an added LED annunciator in the display. The new annunciator indicates whether you're using the tuning dial or bandswitching functions. The 751A also has smoother tuning. While the 751's tuning was good, the 751A's tuning is even better. It feels silkier and features a newly designed tuning knob.

Many of the improvements, however, are "under the skin." For example, the new 751A is even more stable than the 751 thanks to a new thermal sensor that monitors internal temperatures. The sensor automatically turns on the fan which, in turn, ensures that there's no thermal drift.

Further, the new model boasts a 9-MHz notch which drastically reduces QRM. In fact, just using the passband tuning control and the notch filter will be enough to knock out any QRM on a particular signal. The 500-Hz CW filter is like icing on the cake. And, in some cases, I wonder if you really need the filter.

Other worthwhile improvements over the 751 are a new agc system, new compressor circuitry for better audio, and a new af gain control system, which improves control of CW sidetone volume.

With all these improvements, though, there are a couple of important items to note on the CW keyer and the noise blanker. The CW keyer speed control is decidedly nonlinear. Like many analog meters, large changes in speed are crowded into small spaces on the dial. This means that it's tough to find precise speed control toward 40 wpm. Further, at 40 wpm the weighting tends to become shaky and imprecise. The QSK feature is a nice addition, but for most operators it's probably overkill.

The 751A features a selectable noise blanker which eliminates all but the most stubborn wideband and narrowband noise. (I have a source near my house that's virtually impossible to eliminate, but the blanker managed to get a good chunk of it.)

But, while it's a nice feature, it's not without problems. At its highest settings, it causes CW signals to become distorted, almost keyclick-like in tone. It's something you should be aware of if you're planning to buy this radio. However, it isn't a major problem because most of the time you'll probably operate the noise blanker at a lower setting.

Conclusions

Overall, then, the 751A is a worthwhile improvement over the older 751. It corrects some of the flaws that were readily apparent in the older version and improves upon the radio's already solid basic features.

If you're looking for a new HF rig that combines general coverage and multimode capability, look at the 751A. You won't be disappointed. ■

144-MHz Antenna Test: Three For Two

by Peter H. Putman KT2B

Cushcraft 32-19 and 42-18XL Boomers
Cushcraft Corporation
PO Box 4680
Manchester NH 03108
Price Class: 32-19 $140
42-18XL $150

Tonna F9FT 17-Element Yagi
The PX Shack
52 Stonewyck Drive Belle
Mead NJ 08502
Price Class: $120

Number 10 on your Feedback card

Last year was a grand one for French and American relations, owing to the 100th anniversary of the Statue of Liberty. With that in mind, it seems entirely appropriate to review these products—the premier 144-MHz yagis from two of the best-known names in antennas here in the United States and in France.

Cushcraft Corporation of Manchester, New Hampshire, has long been known for their 32-19 19-element "Boomer," as it has come to be known. This is one of the most popular antennas in the world for weak-signal work on 2 meters, and its popularity supports its performance and durability. Recently, Cushcraft introduced the 42-18XL 18-element yagi, using a 28-foot boom for that extra 1 dB of gain, based on the 19-element version.

Antennes Tonna of Reims, France, is no stranger to the weak-signal world either! Many of the top operators in Europe employ their 17-element yagi stacked in H-frames for contest and EME work. Tonna has long been known for their innovative square booms and easy product assembly, and is now making inroads in the U.S. market. The comparative figures for each antenna are listed in Table 1. Note that gain figures are based on manufacturer's claims.

Representative models of these yagis were obtained "off-the-shelf" for the purposes of this review. The F9FT Tonna arrived about the same time UPS dropped two big boxes from New Hampshire on my doorstep, and I commenced with the project.

Assembly

The F9FT Tonna comes with the various elements bundled together with tape. The boom sections (four of them) are marked with colored tape at the ends to aid in matching the correct boom sections quickly. On all Tonna antennas that I've used, one end of the boom has a red cap and the other a black cap. This matches the boom brace as well.

As mentioned earlier, Tonna employs square boom material. This makes assembly much easier, as you simply snap the element into a molded plastic mount (the center of each element is marked with a crimp), then fasten the element to the boom with a wing screw and nut. The mount is channeled to fit securely to the boom. Incidentally, all of the mounting hardware is separated into various bags. This is a big help as you don't need to sort out all of the hardware you don't need at the moment to get to what you do need. All hardware is stainless steel except the boom-to-mast clamps, which are galvanized.

The driven element is pre-assembled and tested at the factory. It also fastens with one wing screw to the square boom. The trigon reflector assembly attaches with pre-threaded steel plates and wing screws. You really need only a 10mm wrench to assemble the whole thing, and Tonna includes 2 brackets to accommodate up to a 2" mast. One is also fitted snug to the square boom, and the other is attached to the brace. Incidentally, the

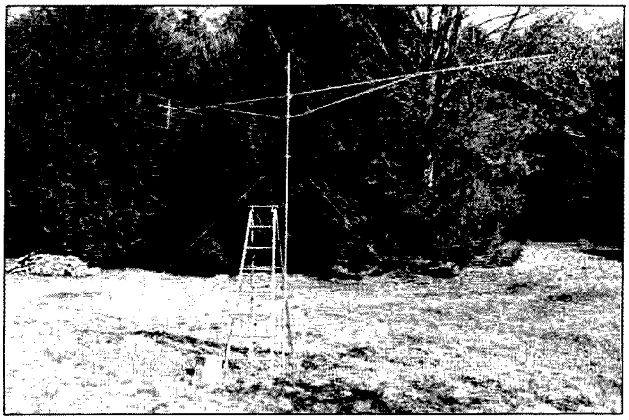


Photo A. The Tonna F9FT 17-element yagi.

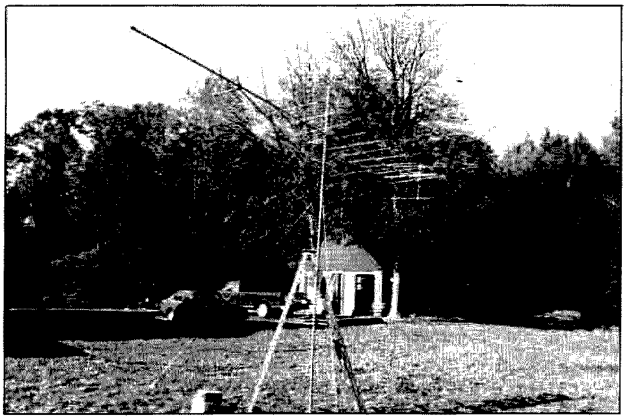


Photo B. Cushcraft's 32-19 Boomer.

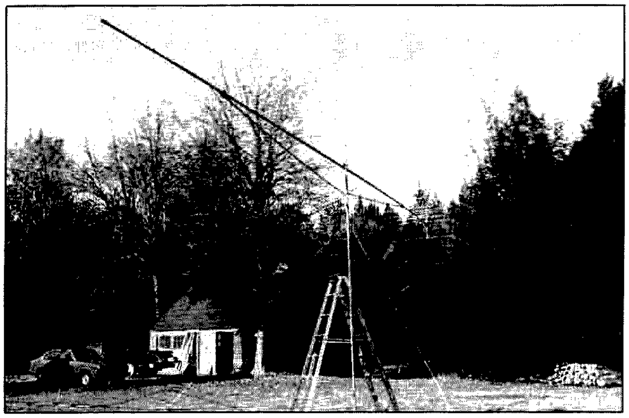


Photo C. Cushcraft's 42-18XL Boomer.

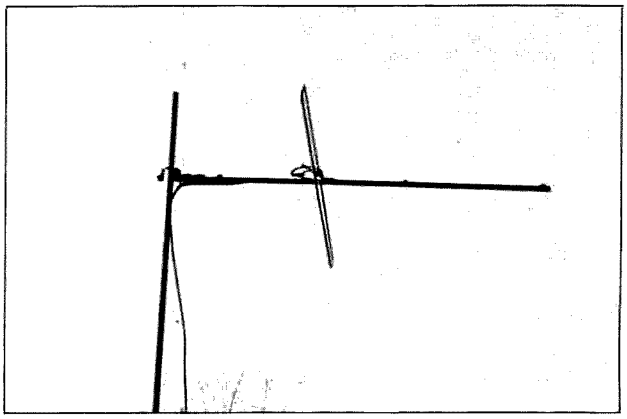


Photo D. Test source antenna at 15 feet.

brace also is made from square aluminum stock.

The 32-19 Boomer also comes with the various elements bundled together. Unlike the F9FT, however, all of the hardware is together in one big bag. This is a pain in the neck since you must inventory all of the parts for the antenna first before starting assembly. You also run the risk of using the wrong screw in the wrong place (as I did) as well as even losing a nut, washer, or screw someplace (which I also did).

The boom sections are constructed from 1-1/4" aluminum tubing, which is fairly strong material. The boom braces are made of 1-1/8" and 1" tubing. All hardware used is stainless steel including the boom-to-mast clamps. Note that the boom sections are not color coded, and you must measure the pieces carefully to make sure you have them in the right order. (This is less of a problem than on the 42-18, which we'll get to in a moment.) Stainless hose clamps and screws are used to secure the various sections together.

You'll need an 11/32, 5/16, and 7/16 nutdriver to assemble this antenna. Make sure you have a clear and clean work area (a paved driveway is best, since loose nuts and screws show up easily) with enough room to turn this antenna around as you work. The driven element requires assembly, although the tap points for the T match are indicated with a marker. The trigon reflector attaches with a pair of clamshell-type clamps and screws. It must be aligned carefully! Each element attaches with a special clamp and support bracket, ensuring correct alignment on the boom.

The 42-18XL Boomer is a huge beast and requires a lot of room for assembly. Again, as in the case of the 32-19, all of the hardware comes in one big package and you must presort before starting assembly. Boom sections are constructed from 1-1/2" material with 1-1/4" sections attached, so it is somewhat heavier than the 32-19. All hardware supplied is stainless steel, including the hose clamps and boom-to-mast clamps. The trigon reflector attaches to the boom in the same manner as it does with the 32-19.

Again, you'll need 11/32, 5/16, and 7/16 nutdrivers to assemble this antenna. A screwdriver would also help. As on the 32-19, the boom sections are not marked, and since two of them are of different lengths, they can easily be confused (as I did). Measure carefully and mark the adjacent sections with different colored markers. You'll also need to construct the T match yourself, and the instruction guide tells you where to make the tap. It's not marked as it is on the 32-19.

Let's now review some observations regarding construction. It took me about 45 minutes to assemble the F9FT—it's that easy. The 32-19 Boomer took about 1-1/2 hours, while the 42-18 took about 2 hours. The 42-18XL was the most complicated assembly I've seen in a long time! In addition, I wound up short two sets of screws and nuts on the 32-19, while the 42-18XL had two extra sets (how convenient!). The F9FT wound up with one extra wingscrew, holder, and nut assembly.

When the F9FT is done, all sections are rigid, including the boom brace. You merely lift it up to the mast and attach the U-bolts, which is a big advantage of using square boom material. The 32-19 is somewhat floppy, and I suggest making the final adjustments on the boom brace after the main boom is attached to the mast. The boom brace-to-mast clamp is kind of fishy and twists on you while you're tightening it. The 42-18XL is also floppy, and the same procedure is suggested for final brace alignment.

With the F9FT's square boom material, it's a snap to make sure all elements are plumb, in line, and 90 degrees from the vertical plane. Using round tubing does make this job somewhat more difficult, but the elements on the 32-19 were also extremely plumb and in line. The drilling job on the 42-18 was, in my opinion, substandard. At least four elements were not in line, as was one of the two trigon reflectors. How much difference would this make? We'll find out in the measurements!

As far as mechanical integrity, I have no doubts about the 32-19 and F9FT standing up to a good wind. Simply put, the F9FT doesn't offer much wind resistance, and the 32-19 boom material is a good strength for the boom length. The 42-18XL is made of much heavier material and offers a bit more target for high winds, but should survive most bad weather conditions. Keep in mind that the 42-18XL is 28+ feet long and will "twist" more in a breeze. Construction of the F9FT and 32-19 both rate very high. The 42-18XL drops a few notches due to the poor drilling job.

	F9FT 17	32-19	42-18XL
Length	21′ 6″	22′	28′ 9″
Weight	14 lbs.	12 lbs.	14.3 lbs.
Feed Imp.	50 Ohm	50 Ohm	50 Ohm
Frequency Range	138.0–148.7	144.0–146.0	144.0–145.0
Forward Gain	15.3 dBi	16.2 dBd	17.2 dBd
Front/Back Ratio	36.9 dB	24 dB	24 dB
Sidelobe Attenuation at 90 deg.	>50 dB	>60 dB	60 dB
Connector	Type N	SO-239	SO-239
Matching Network	T Match	T Match	T Match
Swr at Frequency	1.2:1	1.2:1	1.2:1

Table 1.

Measured	**F9FT**	**32-19**	**42-18**
Test Source	+4.5 dB	+4.5 dB	+4.8 dB
(Reference Signal) Sidelobe	−38 dB	−32 dB	−38.5 dB
Rearward Lobe, Max.	−15 dB	−13 dB	−12 dB
Feedpoint Swr	1.3:1	1.2:1	1.3:1

Table 2.

Measurement	**F9FT**	**32-19**	**42-18**
Sidelobe Rejection	−42.5 dB	−37.5 dB	−43.3 dB
F/B Ratio	19.5 dB	17.5 dB	16.8 dB

Table 3.

Test Setup

Moving to the field resulted in interesting data. I decided that to try making forward gain measurements would be pretty nigh impossible given my modest setup. What I elected to do was measure the difference in a given gain figure between the antennas as well as check front-to-back ratio (F/B) and sidelobe rejection at the 90-degree point. In addition, I verified the feed impedance claims as well. I decided to set each antenna up on a 15′ piece of masting with nylon guys and sliprings for rotation.

Now, one big problem is that 15 feet is not really enough to make this measurement—it probably ought to be more like 25 to 30 feet. However, I wasn't in a position to use 25 to 30 feet of masting and climb up and down mounting to remove the various beams, so 15 feet it was. Since the antennas exhibited such similar claims for gain, F/B ratio, and sidelobe rejection, I suspected that incidental ground effects at 15 feet would affect all three antennas about the same, and the resulting data would have some merit.

The rf test source was easy: My Kenwood TR-9000 with the Lo-power switch on was set to exactly 1-Watt output, as measured with the Bird 43 Thruline meter. The source antenna was the folded dipole driven element from a KLM 4-element yagi also mounted at 15 feet (see Photo D). This was located exactly 70 feet from the test yagi mast.

The test yagi mast was carefully located more than 30 feet from any trees, metal objects, and cars so as to minimize reflections from these sources. The only effects would be ground reflections as I mentioned earlier. The

procedure used was to attach the particular yagi in question, set the power to 1 Watt on the exciter, then take careful measurements for maximum forward gain, maximum null at 90 degrees to the rf source, and peak the measurements off the back to establish an F/B ratio.

My assistant (my brother Miles) helped me to make sure the booms were level when tightening the braces and also operated the mast using a vise-grip while I checked the readings on a Boonton Model 902 rf millivoltmeter.

Results

Photos A, B, and C show the F9FT, 32-19, and 42-18, respectively, undergoing measurements. Table 2 contains the resultant data. As you can no doubt tell, ground effects were certainly evident. As you also can tell, they seemed to affect each antenna about the same, so that no one yagi had an advantage over another. What can we deduce from these measurements? First of all, it would appear that the F9FT and 32-19 are about dead even in terms of forward gain, whatever the actual number is (and the claimed numbers are 15.3 dBi vs 16.2 dBd, respectively). The 42-18 showed a modest increase in gain—only .3 dB—and I attribute that mostly to some ground effects. No doubt the misalignment of several of the elements had some effect as well.

Take a look at Table 3 for some other interesting data. Again, the effects of ground reflection are apparent. It seems safe to say that one may assume each antenna to have greater than 50 dB of sidelobe rejection.

Cushcraft claims 24 dB F/B ratio for both of its products, and while I think the actual figure is more in the neighborhood of 20 dB, the claim is not out of line. Tonna claims almost 37 dB F/B, and I find this hard to believe! But the 17-element yagi did exhibit 2 dB better than its nearest competitor, so I would have to assume—all things being equal—that it has the best F/B ratio of all three yagis. The 42-18 wins in the forward gain category by a slim margin, while no doubt at the greatest disadvantage in the tests.

To summarize:

Category	Winner
Gain	42-18 (.3 dB better)
F/B Ratio	F9FT (19.5 dB)
Sidelobe Rejection	42-18 (−43.3 dB)
Ease of Construction	F9FT
Quality of Construction	32-19/F9FT (A tie!)

And there you have it—not the most scientific test in the world, but one which probably approaches the conditions in the average amateur installation. (After all, who stacks their antennas 25 feet apart on the same mast?)

The Cushcraft 32-19 and 42-18 Boomers are available at most amateur dealers. The F9FT 17-element yagi is manufactured by Antennes Tonna of Reims, France and is available through the PX Shack. For more information, check the appropriate Reader Service number: Cushcraft 200, PX Shack 201.■

SCORE

by Perry Donham KW1O

MJC Technologies
3704-1/2 Foothill Blvd.
Suite 524
La Crescenta CA 91214
Price class: $100

Number 11 on your Feedback card

MJC's Sweepstakes Contest Operating Results Enhancer (SCORE) program is a contester's dream come true. SCORE is a complete tracking system for a single contest, the November ARRL Sweepstakes. The program dupes, logs, keeps score in real time, displays contest statistics, turns your Pro-Search rotor, and controls the station transceiver (currently only Heath's SS-9000 and Kenwood's TS-940 are supported).

The software runs on any IBM PC or compatible with at least one disk drive and 128K of RAM. Full color is supported if you have a color graphics adapter, but the system works and looks just fine in the monochrome mode.

Configuration

SCORE is an extremely flexible package. A series of preference screens let you set up the contest just the way you want it. Along with the expected call, exchange, section, and time information are places to choose band edges, antennas, USB or LSB, CW wide or narrow filters, display color and design, printer control sequences, and so on. With these screens you can create a unique contesting system specifically tailored to your operating habits.

The display is divided into two sections. The Control Panel, on the top of the screen, is where stations are logged and where the real-time statistics are kept. Time is automatically logged, as is the band and frequency (if you're computer-controlling a transceiver) of the contact. To the right of the log information is a box that shows your total contacts and sections, your score, and your total active and off time.

Below the Control Panel is a large area with a variety of functions. You can choose to display a running log book, transceiver and rotor information, or a list of sections worked/needed.

Contesting

I used SCORE for the CW section of the 1986 Sweeps. To see how user-oriented the program was, I decided not to look at the manual before the contest started. The menus and on-screen instructions were very clear and easy to follow, and I had no trouble setting all of the appropriate features to match my station. An on-screen context-sensitive help file is available if you get stuck; "context sensitive" means that the program keeps track of what you're trying to do and gives you help automatically on that topic.

Once the program was configured, I turned my attention to the contest (already in progress). Forty meters seemed open; since that was also the default band on the Control Panel, I quickly bagged about twenty QSOs. An immediate problem surfaced: SCORE uses a lookup table to help you enter the section (you only need to type *enough* letters to uniquely identify the section—WN for WNY is an example). The table unfortunately doesn't use two-letter postal abbreviations. Instead of typing AZ for Arizona, for example, you have to use ARI.

Frowning a bit from the abbreviation thing, I decided to move to 80 meters and work some of the fellows closer in. I quickly discovered that I couldn't change the band setting on the Control Panel. The only reference to the band in the manual was a brief blurb that told me I couldn't change the band manually while in transceiver-control mode. It turned out that the reverse tab key was the one to use, but it was just a fluke that I figured it out.

The rest of the system worked flawlessly, and I quickly got into a comfortable pattern of operating. The duping is very fast, and I ran along with the sections worked/needed report on the screen. It was a real treat to watch my score steadily climb, although I ended up watching it a bit too much.

Reports

Report generation is the icing on the SCORE cake. The program can spit out a variety of information, including the standard summary sheet and contest log. One of the more interesting reports is an operating profile, which depicts graphically what bands you worked and when, how many contacts were made on that band, and your QSO rate. This becomes useful when you start to plan next year's contest (you can see what you did this year and try something different!). The program keeps track of your on and off times, too, so you can immediately see how much time you need to wait before coming back on the air.

High SCORE

I give the SCORE package high marks. If you have the SS-9000 or the TS-940S, you will certainly appreciate the ability to control the rig right from the keyboard. As for making the switch to a computer for logging, I've operated this contest for many years and didn't miss my old paper dupe sheets one bit.

I should mention that the current release of SCORE, including a version in the works for the ARRL DX test, fixes the problem of bandswitching and also allows two-letter abbreviations.

For additional information about SCORE, please check Reader Service number 203.■

Heil Ham Radio Handbook

by Chris Schmidt KA1MPL

Melco Publishing
PO Box 26
Marissa IL 62257
Price: $10.95 ppd.

Number 12 on your Feedback card

This is going to sound contrived, but I swear it isn't. As I was sitting at my desk trying to start this review, a co-worker, Phil (not a ham), came up to me and said: "Can I borrow that book that you left on your desk last night? Normally that ham radio stuff bores me to death, but that book is really interesting."

"That book" is the *Heil Ham Radio Handbook* and it is not like most other ham literature. Bob Heil K9EID treats ham radio as a fun pastime, not an exact science. A disclaimer to that effect is printed in the preface: "We present this handbook not as a literary masterpiece but as a practical guide for all to learn more about amateur radio and pray that perhaps each one of us will become a better operator because of it." The very fact that the *HHRH* makes no attempt to be comprehensive *allows* it to be fun reading. It is a reference book that doesn't read like one.

For the Newcomer

The *HHRH* assumes that the information you "learned" to pass your license test won't do you much good when it comes to the practical realities of getting on the air. Since the new licensee's first question is invariably, "OK, how do I get set up?" *HHRH* gives you clear instructions in plain (non-ham) language on what to do: selecting a station location, providing ac power and grounds, installing a feedthrough pipe in a wall, finding good used equipment, and selecting the best antenna for your available space. All ham lingo is explained when it appears, which prevents the newcomer from feeling like an outsider in his new hobby.

Operating Procedures

Chapter Three, "So You Want To Be A Lid," tells you exactly how to do so in no uncertain terms. Examples are taken from practices commonly heard on the air every day. K9EID is trying to clean things up a bit. He encourages you to take a quick listen on 27 MHz to hear the kind of operating habits we're moving towards. He also stresses that many hams acquire their lifelong operating habits on the local repeater, and he encourages new hams to hold themselves up to a higher standard.

Antennas

All the standard designs are explained and construction details are given for quite a few antennas—this is the most extensively covered topic in the book. K9EID takes great pains, though, to not take the fun out of what many consider to be the most interesting part of ham radio—fooling around with antenna construction: "The bottom line is, dive in and put some things together. If it works, super. If it doesn't, it's back to the drawing board and onto the tower."

Everything Else

In a similarly practical manner, the book covers remote bases, mobile operation, audio equalization (a K9EID specialty), a review of simple electronics, home-brewing tools and techniques (from soldering to building enclosures), grounding and RFI, and troubleshooting. It also includes 40 simple projects you can build.

In case you haven't figured it out, I think the *HHRH* is a great book. For a ham just starting out, I can think of no better tool to use—it is 168 pages of patient Elmering. But to imply that the *HHRH* is useful only for beginners is to do it a grave injustice. No matter how long you've been licensed, you'll find relevant and practical information—in plain English, not in engineerese—that will make you a better operator.

For more information on the *Heil Ham Radio Handbook*, check Reader Service number 204.■

ANNOUNCING:

73 Magazine's DX Dynasty Award

One day not too long ago the staff of *73* was sitting at lunch over at The Folkway talking about DX and DXing and how crazy DXCC had gotten. The DXCC Honor Rollers have nothing left to work, and folks coming into the program have no hope of working countries that haven't been on the air for twenty years.

By the time we got around to coffee and mocha chip cake we had decided to start our own DX award. We wanted everybody to start with zero countries to liven things up a bit on the bands. Wayne suggested that we add to the ARRL's DXCC countries list by searching through the awards programs of IARU members. We decided to offer endorsements for every mode we could think of.

We want you to *have fun* with this award. The rules are simple, but the variety of levels and endorsements makes the award a challenge for both the beginner and the experienced DXer. We've come up with nearly 400 countries, so you'll not soon run out of things to work!

The Award

The basic award will be issued for 100 countries worked. Endorsements will be made for 150, 200, 250, 300, 350, 375, and 400 countries worked. The basic award is mixed-mode.

Special endorsements are available for single-band operation and for specific modes, including CW, SSB, satellite, Baudot RTTY, ASCII RTTY, AMTOR, packet, spread-spectrum, QRP (less than 5 Watts output), EME, FM, AM, FAX, and SSTV. Logs submitted for special endorsements must clearly indicate the band and mode used for all contacts.

The Rules

Effective Date: Only contacts made after 0001Z on January 1, 1987, will be eligible for the DXD Award.

Bands: Contacts may be made on any amateur band except 10 MHz. No cross-band contacts are allowed.

Modes: Any mode available to amateurs in your country may be used. Cross-mode contacts are allowed: The mode that *you* are using is what counts for the DXD Award.

Minimum report: There is no minimum signal report (you can't work 'em if you can't hear 'em).

Applications: QSL cards are not required for the DXD Award. Application must be made on an official DXD form, available from *73* Magazine—send an SASE to WGE Center, Peterborough NH 03458, Attn: DXDA. On the form, list your contacts in callsign order, indicating date, time, frequency or band, mode, and power. We may, on occasion, ask to see your log, so no funny business.

Fees: The fee for the basic award, due upon application, is U.S.$6. IRCs are not accepted. Each additional endorsement is U.S.$2. *Note: Endorsements requested on your first application are free.*

Country Criteria: Countries on the DXD Award list are taken from the awards programs of IARU member nations. If you come across a country not on the list that you feel should be included, send a copy of award rules from an IARU member which lists that country as being valid for an award to *73* Magazine for evaluation. New countries will be added as needed and announced in *73*.

Countries List: The DXD Award countries list will be printed from time to time in *73*. A copy of the current list (just under 400 countries, but still climbing) and an official application form are available from *73* Magazine, WGE Center, Peterborough NH 03458, Attn: DXDA.

Ready, Set...

Who will be the holder of DXDA #1? Who will be the first to hit the 300 country mark? Everyone has an equal shot at it, starting January 1st. We'll publish a list of DXD Award holders every month so that you can see how you are doing.

Excuse me, I see that it's 0001Z... CQ DX, CQ DX, CQ DX... ■

To receive a copy of the current DX Dynasty Award countries list and an official application form, send an SASE to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: DXDA. *73*'s DX Map of the World is available for $5 ppd.

Joseph J. Carr K4IPV
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A Power Supply Primer: Part II

Filtering the rectifier output.

Number 1 on your Feedback card

In Part I of this series (November, 1986) we discussed transformers and rectifiers. You learned that the transformer has a primary VA rating, which you should not underrate when you design electronic projects. You also learned that there are two basic forms of rectifiers, half-wave and full-wave, with the full-wave being preferred for almost all applications. There are two types of full-wave rectifiers: regular (which require two diodes and a center-tapped transformer) and bridge (which require four diodes, but no center-tap on the transformer). The center-tapped transformer will deliver twice the voltage when used with a bridge rectifier instead of with a two-diode regular circuit, but only half the current. The peak-inverse-voltage (piv) rating of the diode must be not less than 2.83 times the applied rms voltage, with most designers preferring 3 to 4 times as the minimum.

This month, I will discuss filtering of the pulsating dc output from the rectifier. But first, let's review the differences between the full-wave and half-wave rectified dc output.

Alternating current is *bi-directional*. That is, the current flows in one direction for a half cycle, and then it reverses direction and flows in the opposite direction for a period of time. In a perfect sinusoidal ac, the peak voltage in each direction is the same (even though polarity is opposite), and each half cycle occupies exactly the same amount of time. In 60-Hz ac systems, the period of the ac waveform is 1/60 second, or 16.67 milliseconds—each half cycle takes 8.34 milliseconds.

The output of a rectifier is *unidirectional*. That is, current flows in only one direction—like true dc. But this output is not pure, true dc, as can be seen in Fig. 1. The output of a half-wave rectifier is shown in Fig. 1(a). Only one-half of the ac waveform is used, so there are half-cycle gaps in the output voltage that represent the time required for the negative half cycle. The full-wave rectifier is more efficient and uses both halves of the ac cycle—Fig. 1(b). Note the difference in fre-

Program Listing 1.

```
100  REM  The name of this program is BRUTEFIL.
110  REM  This program will calculate either the ripple factor
120  REM  of a known power supply filter, or, the capacitance
130  REM  required to achieve a specified ripple factor.
140 GOSUB 1330
150 PRINT "This program will compute either the capacitance"
160 PRINT "needed to achieve a given power supply ripple factor,"
170 PRINT "or, the ripple factor of an existing power supply.
180 PRINT "The type of power supply for which this program is"
190 PRINT "designed is the BRUTE FORCE type in which a single"
200 PRINT "large value filter capacitor is connected in parallel"
210 PRINT "with the load."
220 PRINT
230 PRINT
240 GOSUB 1370
250 GOSUB 1330
260 PRINT "Select type of calculation to be performed:"
270 PRINT
280 PRINT "1.  Ripple factor of a given power supply"
290 PRINT
300 PRINT "2.  Capacitance needed to achieve a specified"
310 PRINT "    ripple factor (r)"
320 PRINT
330 PRINT "3.  Input voltage to produce required output voltage"
340 PRINT
350 INPUT "Choice Please:",A
360 IF A > 3, THEN GOTO 260
370 ON A GOTO 380,670,950
380 GOSUB 1330
390 PRINT "Now, let's collect some information -- OK?"
400 PRINT
410 INPUT "Output Voltage at Full Load?",VO
420 PRINT
430 INPUT "Maximum load current (Amperes)?",I
440 PRINT
450 INPUT "Value of Filter Capacitor C1 in uF?",C1
460 PRINT
470 C = C1/(10^6)
480 RL = VO/I
490 RFH = 1/(208*RL*C)
500 RFH = RFH*100
510 RFH = INT(RFH)
520 RFH = RFH/100
530 RFF = 1/(416*RL*C)
540 RFF = RFF*100
550 RFF = INT(RFF)
560 RFF = RFF/100
570 GOSUB 1290
580 PRINT "Fullwave Ripple Factor:";RFF
590 PRINT
600 PRINT "Halfwave Ripple Factor:";RFH
610 PRINT
620 GOSUB 1370
630 GOSUB 1400
640 IF S = 1, THEN GOTO 380
650 IF S = 2, THEN GOTO 250
660 IF S = 3, THEN GOTO 1500
```

Listing 1 continued.

```
670 GOSUB 1330
680 PRINT "Let's collect information, OK?"
690 PRINT
700 INPUT "Output Voltage at Full Load?",VO
710 PRINT
720 INPUT "Maximum load current (Amperes)?",I
730 PRINT
740 RL = VO/I
750 INPUT "Desired Ripple Factor?",RF
760 PRINT
770 C1H = 1/(208*RL*RF)
780 C1F = 1/(416*RL*RF)
790 GOSUB 1290
800 C1H = C1H*10^6
810 C1H = INT(C1H)
820 C1F = C1F*10^6
830 C1F = INT(C1F)
840 PRINT "To achieve a ripple factor of ";RF
850 PRINT "use a capacitor as follows:"
860 PRINT
870 PRINT "Fullwave circuit:";C1F;" uF"
880 PRINT "Halfwave circuit:";C1H;" uF"
890 PRINT
900 GOSUB 1370
910 GOSUB 1400
920 IF S = 1, THEN GOTO 670
930 IF S = 2, THEN GOTO 250
940 IF S = 3, THEN GOTO 1500
950 GOSUB 1330
960 PRINT "Now let's collect some information"
970 PRINT
980 INPUT "Required Output Voltage Under Load? ",VO
990 PRINT
1000 INPUT "Maximum load current (Amperes)? ",I
1010 PRINT
1020 INPUT "Filter capacitance being used (uF)? ",C
1030 PRINT
1040 C1 = C/10^6
1050 VPH = VO + (I/(240*C1))
1060 VPH = INT(VPH)
1070 VPF = VO + (1/(120*C1))
1080 VPF = INT(VPF)
1090 PRF = ((VPF-VO)*100)/VPF
1100 PRF = INT(PRF)
1110 PRH = ((VPH-VO)*100)/VPH
1120 PRH = INT(PRH)
1130 GOSUB 1290
1140 PRINT "Required Peak Pulsating DC Voltage:"
1150 PRINT
1160 PRINT "Halfwave case:";VPH
1170 PRINT "Fullwave case:";VPF
1180 PRINT
1190 PRINT "Voltage Regulation:"
1200 PRINT
1210 PRINT "Halfwave:";PRH;" %"
1220 PRINT "Fullwave:";PRF;" %"
1230 PRINT
1240 GOSUB 1370
1250 GOSUB 1400
1260 IF S = 1, THEN GOTO 950
1270 IF S = 2, THEN GOTO 250
1280 IF S = 3, THEN GOTO 1500
1290 FOR I = 1 TO 5
1300 PRINT
1310 NEXT I
1320 RETURN
1330 FOR I = 1 TO 20
1340 PRINT
1350 NEXT I
1360 RETURN
1370 PRINT "PRESS ANY KEY TO CONTINUE:"
1380 A$=INKEY$: IF A$="" THEN 1380
1390 RETURN
1400 GOSUB 1290
1410 PRINT "What's Your Pleasure?"
1420 PRINT
1430 PRINT "1.  Do Another of the same sort"
1440 PRINT "2.  Return to main menu to make another selection"
1450 PRINT "3.  Finished"
1460 PRINT
1470 INPUT "SELECTION?",S
1480 IF S > 3, THEN GOTO 1400
1490 RETURN
1500 GOSUB 1290
1510 PRINT "PROGRAM ENDED"
1520 END
```

quency between these two waveforms: The half-wave ripple frequency is the same as the applied ac frequency (e.g., 60 Hz in the U.S.), while the full-wave ripple frequency is twice the ac line frequency (120 Hz in 60-Hz systems). Because of the difference in efficiency, the transformer used to supply a half-wave rectifier must have a primary VA rating 40 percent higher than the transformer used in a full-wave circuit to supply exactly the same output voltage and current levels.

The word "ripple," bandied about as if everyone knows its meaning, indicates the departure from pure dc (which graphs to a flat line) exhibited by the rectified dc. On half-wave rectifiers, the ripple is around 120 percent, while on full-wave circuits it is around 48 percent. Unfortunately, few electronic circuits can tolerate these levels of ripple. In the case of an audio amplifier, the output sound would contain a terrible hum, while the results in other circuit forms range from the annoying to the catastrophic. The purpose of filtering is to reduce the ripple to an acceptable level of annoyance.

In this article, I will simplify matters by assuming that all rectifiers are bridge rectifiers—because they are more easily drawn. But you may assume that the same principles apply equally well to other forms of full-wave rectifiers and (with different values of components) to half-wave rectifiers.

Brute Force Filtering

Perhaps the most common form of filter circuit is the so-called "brute force" filter of Fig. 2. In this circuit, a capacitor (the filter) is connected in parallel with the load (R_L) and the output of the rectifier. It is crude and forceful, but it works nicely.

Circuit action for filter capacitor C1 is shown in Fig. 3. This waveform is for a full-wave rectifier. In the circuit of Fig. 2 there are actually two sources of current for the load: the rectifier and the charge stored in

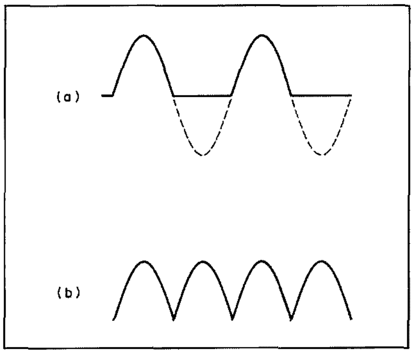

Fig. 1. (a) The output of a half-wave rectifier and (b) the output of a full-wave rectifier.

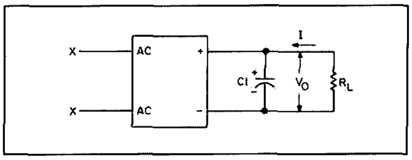

Fig. 2. Brute force filter.

capacitor C1. When the rectifier output voltage is higher than the capacitor voltage, the current in the load is supplied 100 percent from the rectifier. But, when the voltage from the rectifier passes its peak, current from C1 is dumped into the load to take up the slack. This is shown by the shaded areas in Fig. 3. The total energy in the load is thus higher. If you were to examine the waveform across the load when the filter capacitor is in the circuit, the waveform would resemble the heavy line in Fig. 3. The nearer this line is to a flat line, the nearer the dc output is to "pure" battery-style dc.

Half-wave rectifiers have larger spaces between the humps than full-wave circuits, so they must have a larger charge dumped by the capacitor. Because of this fact, the filter capacitors for half-wave circuits must be considerably larger than those for full-wave circuits to produce the same level of output ripple.

The output voltage is dependent on the value of the filter capacitor (see Fig. 3 for an intuitive grasp of this fact). Obviously, if less of the open space is filled in, the average voltage will be less. In one circuit that I built, a full-wave rectifier into a 150-milliampere load produced 13-V-dc output with no filter capacitor, 16.8-V-dc output with 200 uF, and 18-V-dc output when the filter capacitor was increased to 2000 uF. The peak voltage of the rectified waveform was 19 volts.

Ripple Factor

The ripple factor (RF) is the measure of the effectiveness of the filter in smoothing pulsating dc. For the single-capacitor brute force filter of Fig. 2, the ripple factor for a half-wave rectifier @ 60 Hz is $RF = 1/(208 \times R_L \times C1)$, and for a full-wave rectifier @ 60 Hz is $RF = 1/(416 \times R_L \times C1)$, where R_L is the load resistance in Ohms and C1 is the filter capacitance in Farads. (Note: The load resistance R_L is defined as the output voltage V_o divided by the output current I—in other words, $R_L = V_o/I$.)

Example

What is the ripple factor of a 15-V-dc full-wave power supply if 2000 uF is used for C1 in the filter circuit of Fig. 2 and the load resistance is 7 Ohms?

Solution: $RF = 1/(416 \times R_L \times CI)$

$RF = 1/(416 \times 7 \text{ Ohms} \times (2 \times 10^{-3} \text{ Farads}))$

$RF = 1/5.82$

$RF = 0.17$

In general, you don't need the version of the equation given above, but instead you want to select a filter capacitor for a specified value of ripple factor. For those cases, rewrite the equations in the following form:

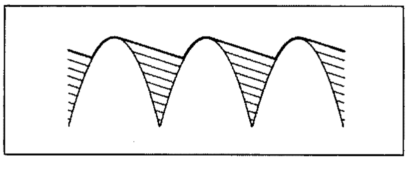

Fig. 3. Circuit action for filter capacitor C1.

$C_{uF} = 10^6/(416 \times R_L \times RF)$, where C_{uF} is the capacitance of C1 in *microfarads* and all other terms are the same as defined above.

The output voltage from this circuit for a half-wave rectifier @ 60 Hz is expressed by $V_o = V_p - (I/(120 \times C1))$, and for the full-wave rectifier @ 60 Hz is expressed by $V_o = V_p - (1/(240 \times C1))$, where all voltages are in volts, I is in Amperes, and C1 is in Farads.

Program listing 1 is a Basic program that

Program Listing 2.

```
100  REM  The name of this program is RCFILTER.PS
110  REM  This program computes the values required for resistor
120  REM  and capacitor elements in an RC filter network in a DC
130  REM  power supply circuit.
140 GOSUB 830
150 PRINT "This program is used to select values for an"
160 PRINT "RC power supply filter circuit."  YOU WILL NEED"
170 PRINT "to select the output voltages (V1 and V2) and currents"
180 PRINT "(I1 and I2), in addition to the desired ripple factors"
190 PRINT "for the two voltage outputs."
200 PRINT "In General, the ripple for the lower voltage output (V2)"
210 PRINT "is considerably lower than for the higher voltage output.
220 GOSUB 790
230 GOSUB 870
240 GOSUB 830
250 INPUT "Higher voltage output (V1)?",V1
260 PRINT
270 INPUT "Output current (in Amperes) for V1?",I1
280 PRINT
290 INPUT "Ripple factor required of V1?",RF1
300 PRINT
310 INPUT "Lower voltage output (V2)?",V2
320 PRINT
330 INPUT "Output current (in Amperes) for V2?",I2
340 PRINT
350 INPUT "Ripple factor required for V1?",RF2
360 GOSUB 830
370 RL1 = V1/I1
380 RL2 = V2/I2
390 C1 = 1/(416*RL1*RF1)
400 R1 = ((V2-V1)/I2) + (1/(120*C1))
410 R1 = -R1
420 C2 = (2*10^-6)/(C1*R1*RL2*RF2)
430 C1 = C1*10^6
440 C2 = C2*10^6
450 C1 = INT(C1)
460 C2 = INT(C2)
470 R1 = INT(R1)
480 PRINT "Capacitances given below are MINIMUM values"
490 PRINT "Select a Working Voltage DC (WVDC) rating that is"
500 PRINT "150-percent of the output voltage, or MORE"
510 PRINT
520 PRINT "*********************************"
530 PRINT "MAIN OUTPUT (V1):";V1;" Volts"
540 PRINT "MAIN OUTPUT CURRENT (I1):";I1;" Amperes"
550 PRINT
560 PRINT "Filter capacitor C1:";C1;" uF"
570 PRINT "Ripple Factor:";RF1
580 PRINT "*********************************"
590 PRINT "LOWER VOLTAGE OUTPUT (V2):";V2;" Volts"
600 PRINT "LOWER OUTPUT CURRENT (I2)";I2;" Amperes"
610 PRINT
620 PRINT "Filter Capacitor C2:";C2;" uF"
630 PRINT "Series Resistor (R1)";R1;" Ohms"
640 PRINT "Ripple Factor:";RF2
650 PRINT "*********************************
660 PRINT
670 PRINT
680 GOSUB 870
690 GOSUB 830
700 PRINT "Select one (1) from menu below:"
710 PRINT
720 PRINT "1.  Do another"
730 PRINT "2.  Finished"
740 PRINT
750 INPUT "SELECTION?",K
760 IF K > 2, THEN GOTO 710
770 ON K GOTO 100,900
780 END
790 FOR I = 1 TO 5
800 PRINT
810 NEXT I
820 RETURN
830 FOR I = 1 TO 30
840 PRINT
850 NEXT I
860 RETURN
870 PRINT "PRESS ANY KEY TO CONTINUE"
880 A$=INKEY$: IF A$="" THEN 880
890 RETURN
900 GOSUB 830
910 PRINT "PROGRAMED ENDED"
920 END
```

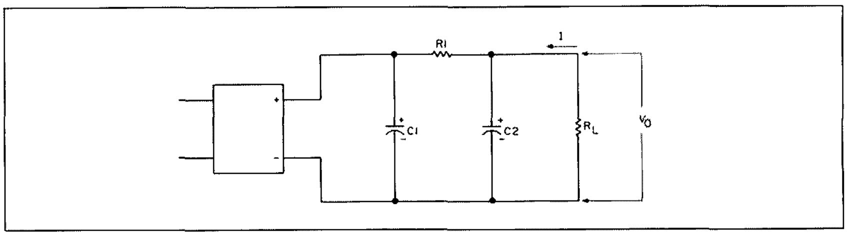

Fig. 4. Pi-section filter.

will calculate (a) the ripple factor of a given power supply, (b) the capacitance required to achieve a specified ripple factor, and (c) the input voltage required from the rectifier to produce a specified output voltage.

Pi-Section Filters

One disadvantage of the brute force filter is that tremendous values are needed to achieve very low ripple-factor figures. If you cascade a simple RC filter with the brute force filter of Fig. 2, you have the pi-section filter of Fig. 4. The ripple factor of V_o is very small, but there is a limit to the output current due to the presence of resistor R1. Also, voltage regulation suffers a little bit when the load current varies widely. The ripple factor for this type of filter for the half-wave rectifier @ 60 Hz is $RF = 10^{-5}/(C1 \times C2 \times R1 \times R_L)$, and for the full-wave rectifier @ 60 Hz is $RF = 2 \times 10^{-6}/(C1 \times C2 \times R1 \times R_L)$, where all capacitances are in Farads and resistances are in Ohms.

Program listing 2 is a Basic program to design RC pi-section filter circuits. This program actually combines two designs, because it assumes that the voltage across C1 is one of the outputs of the power supply, while the voltage across C2 is the other output.

Bleeder Resistors

It is generally good practice to provide a bleeder resistor across the output of a dc power supply. The resistor tends to stabilize the load and, in high-voltage supplies, provide a safety feature against electrocution when you are servicing dc supplies. The bleeder resistor gets its name from the fact that it tends to "bleed off" the potentially lethal charge stored on the filter capacitors. A common specification for high-voltage power supplies is to make the bleeder current equal to five percent of the rated output current. For a 1000-milliampere dc power supply, therefore, the bleeder should be 50 mA (0.050 Amperes). The value of the bleeder should be approximately $R = V/(0.05 \times I_o)$—in the case above the supply produced 700 volts dc; the value should be $R = 700/0.050$, or 14,000 Ohms.

The power rating is defined by $P = IR$, or, in the example above, it should be $0.05 \text{ A} \times 700 \text{ V} = 35$ Watts (use a 50-Watt or higher resistor).

Even low-voltage power supplies should have a bleeder resistor in some cases. In high-current, unregulated power supplies, an unloaded output can produce a voltage that is too high for the filter capacitor. In the S-100 computer power supply, which produces +8 V dc at 5 to 30 Amperes (depending on the system configuration), the typical filter capacitor is rated at 15 WV dc. In one 10-Ampere version that I built, disconnecting the computer motherboard produced +18 volts across the filter capacitor—a dangerous level. A 100-Ohm, 5-Watt bleeder solved the problem.

Filter Capacitor Voltage Ratings

I once repaired medical equipment for a living. There was one bedside oscilloscope in our hospital that used a 200-volt regulated power supply in which the pre-regulator voltage (i.e., across the filter capacitor at the output of the rectifier) was 270 V dc. The filter capacitors were rated at 60 uF @ 350 WV dc, seemingly sufficient. But those capacitors had an exceedingly high failure rate. Out of 12 scopes, at least one would fail every month. The capacitors were swollen, and that often indicates an overvoltage condition.

Let's look at the arithmetic, with normal tolerances considered. The line voltage will vary ±15 percent, so the worst-case voltage will be 1.15 V, or $1.15 \times 270 = 311$ volts. The normal rule of thumb for capacitor ratings (unless the manufacturer claims otherwise) is ±20 percent. Thus, our 350-WV-dc filter capacitor could be in truth a lower voltage device: WV dc (real) = 0.80 WV dc = $0.8 \times 350 = 280$ volts. Under worst-case conditions, then, that errant scope had placed 311 volts across a 280-volt capacitor! Replacing the 60-uF @ 350-WV-dc capacitor with a 60-uF @ 450-WV-dc unit kept me in bed at night—and those nurses had more confidence in both the scopes and their biomedical engineers!

When selecting filter capacitors, then, try to pick one that has a WV-dc rating of 150 percent or more of the required minimum value. If possible, go even higher.

The usual rule of thumb for capacitance in aluminum electrolytic capacitors—the kind normally used in filter circuits—is that the actual capacitance will be −20 to +100 percent of the rated capacitance. Thus, a 1000-uF capacitor will measure 800 to 2000 uF. Keep these figures in mind when selecting a filter capacitor.

Next Time

In the next installment of this series, I will look at voltage regulator circuits including zener diodes, three-terminal IC regulators, adjustable IC regulators, and non-IC regulators. ■

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Operators Aren't Standing By

They're all on the road, running the shack through this super-simple DTMF decoder.

Number 2 on your Feedback card

How can we not be aware of the importance of DTMF (dual tone multi-frequency) in its role in communications? Everywhere you look, touchtone™ keypads are appearing on a wide assortment of equipment, ranging from HTs to the family telephone. Thus, we have a convenient way at our disposal to transmit a coded signal to some receiver. But wait. The telephone's receiver is in a centralized switching center, and our rf receiver is typically a repeater. What we need, therefore, is a cheap and dirty receiver that can decode the DTMF signal and do some work for *us*.

That brings us to the purpose of this article: to describe a circuit for less than $35 that will turn on transmitters, shut off lights, or run our personal computers.

Our circuit is constructed around the Silicon Systems CMOS chip SSI 202 P. (There are several other alternative devices, namely the GTE G8860X, Teletone M-947, etc., but they are not pin-compatible and may have additional features.) The obvious advantage of this device is its simplicity and the reduction of our work. Instead of wiring up a rather large piece of real estate to decode DTMF signals, we can now do the same thing using one 18-pin IC.

Some of the other advantages are: (1) low power consumption, (2) a 5-volt supply, (3) use of a cheap color-TV crystal for frequency reference, and (4) a tri-state output for ease of interfacing to a computer bus.

The circuit that I will describe is a compromise between two modes of reception—the phone and the radio. The circuit is deliberately left open-ended for modification for one's own use.

To start off, one has to bring a +5-volt supply to the card (pin 5). Next, connect the signal input (pin 9); the preferred way to do this is through a .01-uF capacitor. You can omit this input capacitor only if the input voltage is always lower than 5 volts.

The 3.579-MHz crystal, along with a 1-meg, 10% resistor, is installed across pins 11 and 12. The oscillator is enabled by tying pin 8 high. When pin 2 is tied high, the output is hex; when low, it is a binary-coded 2 of 8.

Pin 4 inhibits tone pairs with the 1633-Hz component. Since telephones don't use this band, I tied it high to inhibit it. Pin 3 high enables outputs D1, D2, D3, and D4; when low, the outputs are high impedance.

There is a provision on the board to install 100k resistors to supply or ground to establish a preset on the bus. This would provide an output from the auxiliary chips when the decoder is in a high-impedance mode.

When a tone pair is decoded, pin 14 will go high for approximately 30 milliseconds (or less if reset by pin 15 going high). Our bus output is tied to a 74C42 binary-to-decimal decoder. This will decode each of our touchtone inputs to nine individual output lines. This could easily have been a 4-to-16 driver, but in the interest of cost and size, it was decided to go with nine out. (Due to the touchtone limitation of 12 keys, 16 lines out would be a slight overkill; it also comes in a 24-pin chip, which will use up more space on the board.)

The output of the decimal decoder is then sent to individual JK flip-flops. A provision is installed to allow one digit to be attached from the decimal decoder to the master reset line to all of the flip-flops.

Once reset, a detected dual tone will cause the following series of events to occur:

Pin 14 on the decoder chip will go high; this will in turn put a logic 1 on all of the J and K inputs, and at the same time an enable command is sent to pin 3 of the decoder chip to allow the decoded tone to be put on the data bus. The binary number is decoded and the appropriate decimal output goes low. This high-to-low transition toggles the flip-flop and allows the Q output to change state.

After approximately 30 ms, pin 14 goes low and the data bus returns to its preset value (due to the pull-up or pull-down resistors).

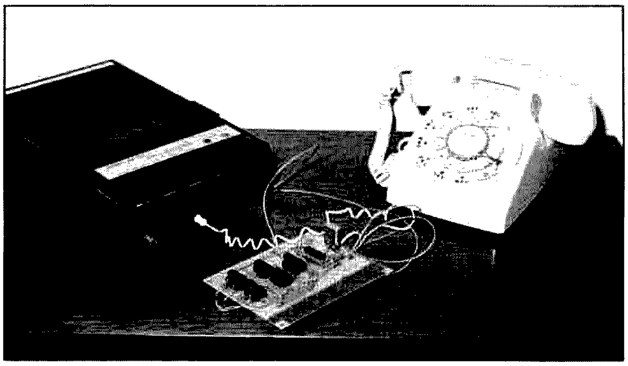

Photo A. The remote-control system, wired and waiting for a call.

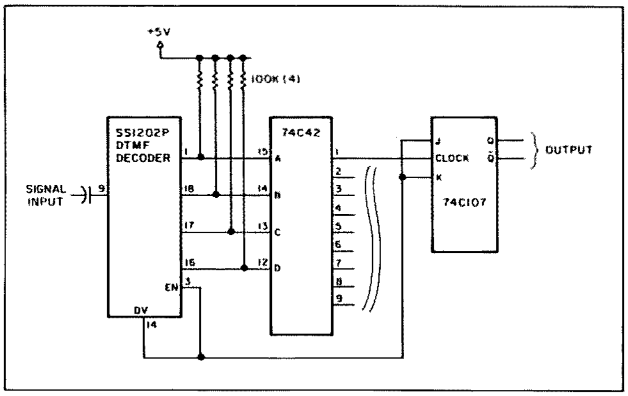

Fig. 1. Circuit concept.

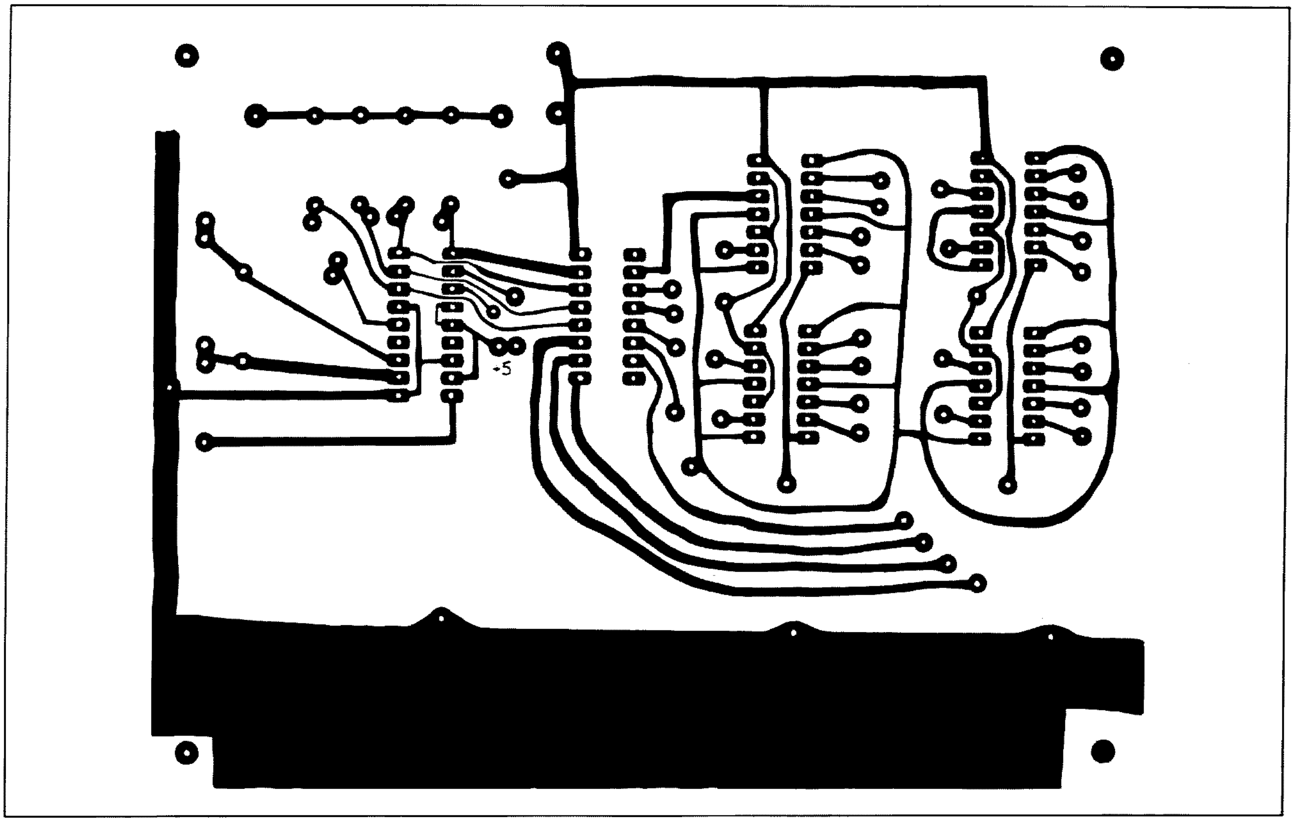

Fig. 2. Circuit board, foil side.

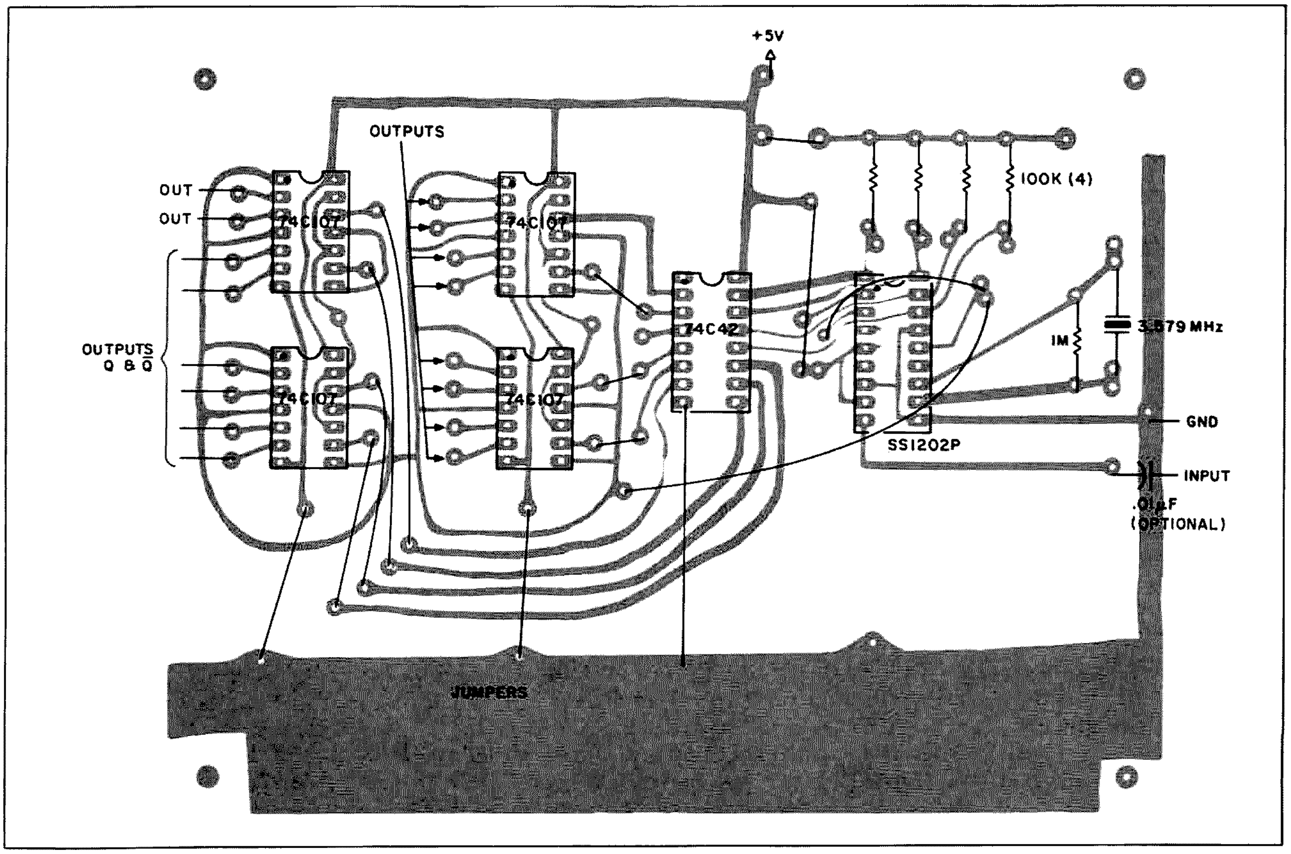

Fig. 3. Circuit board, parts placement.

The decoder decodes the preset value on the bus and causes a corresponding transition on the output. Typically, the preset would be all zeros (binary 0) or all ones (binary 15). Various combinations could be used in tying to the bus allowing the preset to be used in configuring one's own personal code. The flip-flop that was toggled would still be at its transferred state and therefore could be used to turn on/off equipment.

This project was set up for phone use but could be modified for a radio-access code using a few simple parts (possibly including an LS7220 digital lock chip—under $3—to limit access to the equipment). The decoder was tied into a telephone-answering machine procured for $10 at a ham flea market. The output was connected to turn on and off lights and appliances.

Interfacing the equipment is rather simple, the input being the wire to the speaker or input to the tape recorder. The output from the 74C107 flip-flops is limited to 1.75 mA. Therefore, to drive a load more substantial than an optoisolator or a small LED, one would need either a small transistor or a buffer driver. I elected the transistor because of size, simplicity, and cost. I used a 5k resistor to limit the output to 1 mA and used a small switcher (such as a 2N3904, 2N3906, etc.). This can increase output current by an order of magnitude to run a relay. With the addition of some peripheral equipment to the relays, one should be ready to operate one's equipment remotely. ■

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The Glue Ribbon Solution

May the glue-bird of happiness drop some conductive graphite-epoxy mix right where you need it.

Number 3 on your Feedback card

Recently I had a problem in a power supply and traced it to a faulty ground connection. The chassis was aluminum, and this prevented soldering the ground terminal down. Being an inventor, I didn't let this stop me. I *glued* the ground terminal down.

Many times I have built circuits that were too tight for a heat sink or were too sensitive for easy soldering or had any of a number of other problems that made soldering undesirable. A frequent problem is the aluminum chassis we all know and love—but can't solder to. Another is the ubiquitous aluminum antenna element. In each case, a number of people have tried, usually in vain, to solve the problem of poor solder bonds.

I solved my problem with glue.

Many hams know of the silver dust that is used to make a special conductive cement. They also know that the price is out of reach of most of us. I decided to home-brew my own. For the glue base I used two-element epoxy. Instead of silver dust I used powdered graphite, which is available as "dry lock lubricant" and can be purchased anywhere—a discount house in Tulsa carries four brands.

It's common knowledge that this graphite can be mixed with petroleum jelly to make a conductive grease to lubricate bearings on air-dielectric variable capacitors (while maintaining the conductivity across the bearings). It is also used for hand keys on their little bearing points. A toothpick with a dab of this conductive grease on the end will make the key or cap work like a charm.

But my need was not for grease. I needed glue.

I tried to mix up the epoxy and stir in as much graphite as I could. Unfortunately, the carbon was a catalyst for the hardening process, and the stuff hardened before I could stir in enough graphite to have a usefully low resistance. Back to the drawing board (or glue pot, as the case may be) for further study.

Discovery

I took a two-ounce glass pill bottle and put in a half ounce of one component of the epoxy cement (the component that smells like a home permanent). Then I stirred in as much graphite as I could. It hardened immediately. I then tried stirring graphite into another bottle containing the other component of epoxy, which has a faint oily smell. It just sat there! The addition of a little thinner allowed it to take even more graphite. By having most of the graphite premixed into one of the epoxy components, I would gain enough time to use the glue before it set. I capped this mix and set it aside.

> ***"If you work quickly, the reaction will not go to completion while you're trying to get your resistance down to nil."***

When you have an application for the glue, put some of your premixed preparation on a card and add the proper amount of hardener (according to the instructions) and quickly add more graphite. If you work fast, the reaction will not go to completion while you're trying to get your resistance down to nil. You will *barely* have time to apply the cement where you need it.

This glue can be used to make resistors, too. If you need a high-Wattage, low-value resistor, dump a gob of glue between a couple of heavy spade terminals. This works fine with dc. I don't know how it will react to rf.

Caution

The stuff smears terribly. You will need some acetone to wash the glue off of things and a small, sharp pointed tool to clear any bridges from between adjacent circuits. Use the pointed tool after the epoxy sets, and use a toothpick or a cotton swap soaked in acetone to remove the final traces of conductive glue from unwanted places.

The cost? I paid 79¢ for a tube of graphite and $1.98 for the two-part epoxy cement. So far I've used about ten percent of the stuff, and have applied it to everything but the cat, which escaped. We may never have to burn the kitchen table again! ■

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Microwave Building Blocks: The Solfan Special

What started life as a meek intrusion alarm winds up as a hot 10-GHz transceiver.

Number 4 on your Feedback card

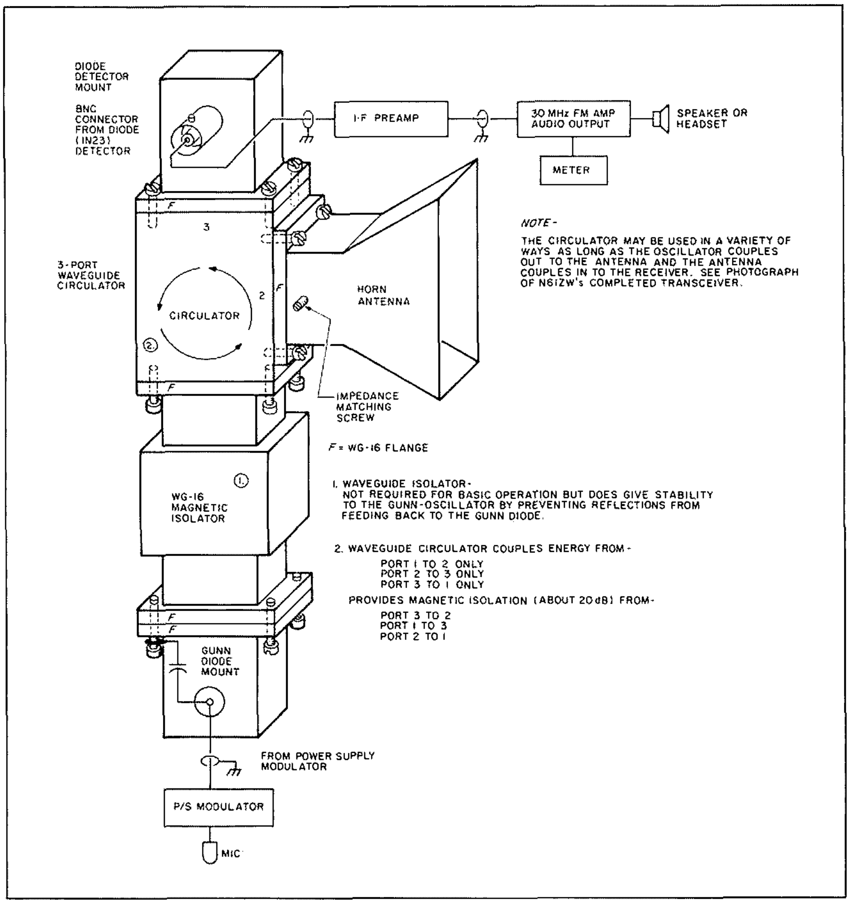


Fig. 1. Waveguide circulator 10-GHz transceiver.

It's not very hard to set up a station for 10 GHz. I have been experimenting with a portion of a Solfan Doppler-radar intrusion alarm that I converted for use at 10.250 GHz. These alarms can be found pretty easily at hamfests, and I have heard many people speak of the high availability of these units in Europe, where this type of alarm circuit is used extensively.

I have found two different types. Whatever unit you obtain can be used with the methods described here. The first unit that I'll describe is the Solfan Intrusion Alarm Gunn diode mount and detector assembly. This has both a Gunn diode and detector diode mounted in the same cast waveguide mount. The waveguide size is WG-16, or 0.4" high by 0.9" wide. It does not have varactor tuning for afc like the Microwave Associates Gunnplexer. The mount is about three inches long with the Gunn diode placed at the rear center of the cavity and coupled to the mixer diode by a small round waveguide iris midway between the two ends of the cavity.

The detector diode is mounted offset to one side of the forward waveguide cavity for low coupling. Both cavities have tuning screws for impedance matching and frequency adjustment. Photos A and B show the end and side views of the various Solfan units. Photo A shows the internal waveguide construction and where the diodes are mounted. Note that the Gunn diode is mounted dead center in the cavity, while the larger detector diode is mounted on the side of the cavity wall.

The second type of Solfan mount is a single Gunn diode transmitter-type unit. This

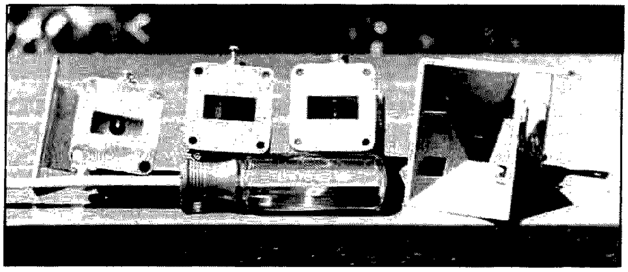


Photo A. Waveguide flange end showing from left to right: iris coupling from single Gunn mounts, detector diode on the side of the cavity, very small Gunn diode mounted in the cavity center, and another single Gunn mount with a small horn.

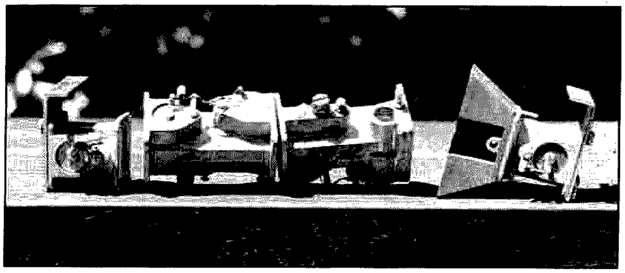


Photo B. Side view of the Solfan Gunn mounts. The ends are the single oscillator units. The center two units are the double mount (oscillator-detector assemblies). Various adjustments and connection terminals are visible.

device does not have a detector diode attached with its cavity. I don't know what the detector mount looks like, as I haven't run into one yet. I've used this mount as a single point source to test other transceivers and have mounted one unit into one port of a 3-port circulator, with a detector mount and an antenna tied to the third port. While sensitivity was slightly lower

"Operation during contest weekend may give some stations an edge of quite a few points by working a surprising number of different grid squares and contact points."

than on other models, it did perform quite well. See Fig. 1 for details on the circulator system.

There are many different configurations of detectors, waveguides, and oscillators that will produce a working station. What your finished product looks like depends on the materials you are able to scrounge up from junk boxes and swap meets. Photo C of N6IZW's completed transceiver using a circulator and detector mount coupled with PC boards described in this article shows how simple components can be assembled into a complete system package. Photo D depicts a minimum transceiver.

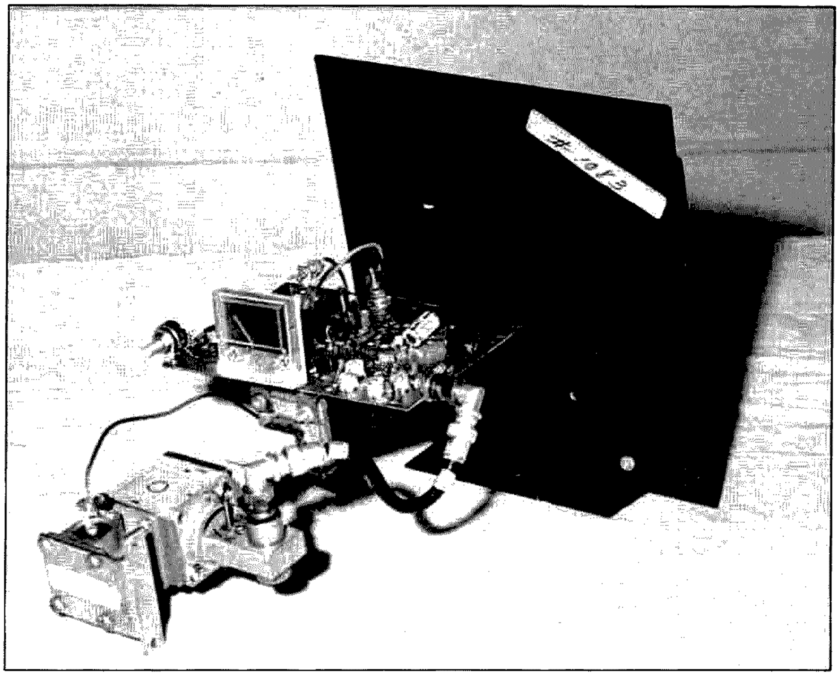


Photo C. 10-GHz transceiver (N6IZW) mounted on a large horn antenna. The system uses a single Solfan Gunn oscillator, circulator, diode detector, and the completed i-f amp, S-meter modulator circuit board.

System Description

To be able to construct a full-duplex transceiver for 10 GHz, you need four basic components: a 30-MHz i-f amp, a power-supply modulator, an i-f preamp, and a Gunn diode waveguide cavity/detector diode assembly. If you can find one of these units at your local swap meet, it will make this project very easy to build. If you cannot obtain one of the units, a suitable oscillator mount and detector assembly may be constructed

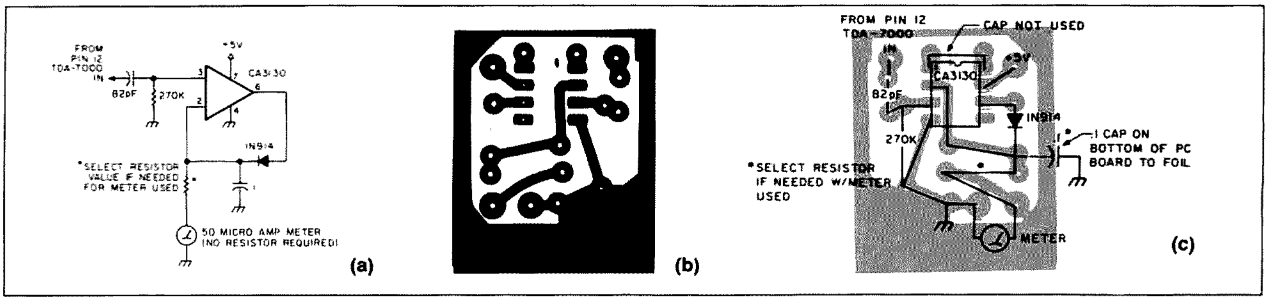


Fig. 2. Signal-strength meter circuit (a) schematic, (b) circuit board, foil side, and (c) parts placement.

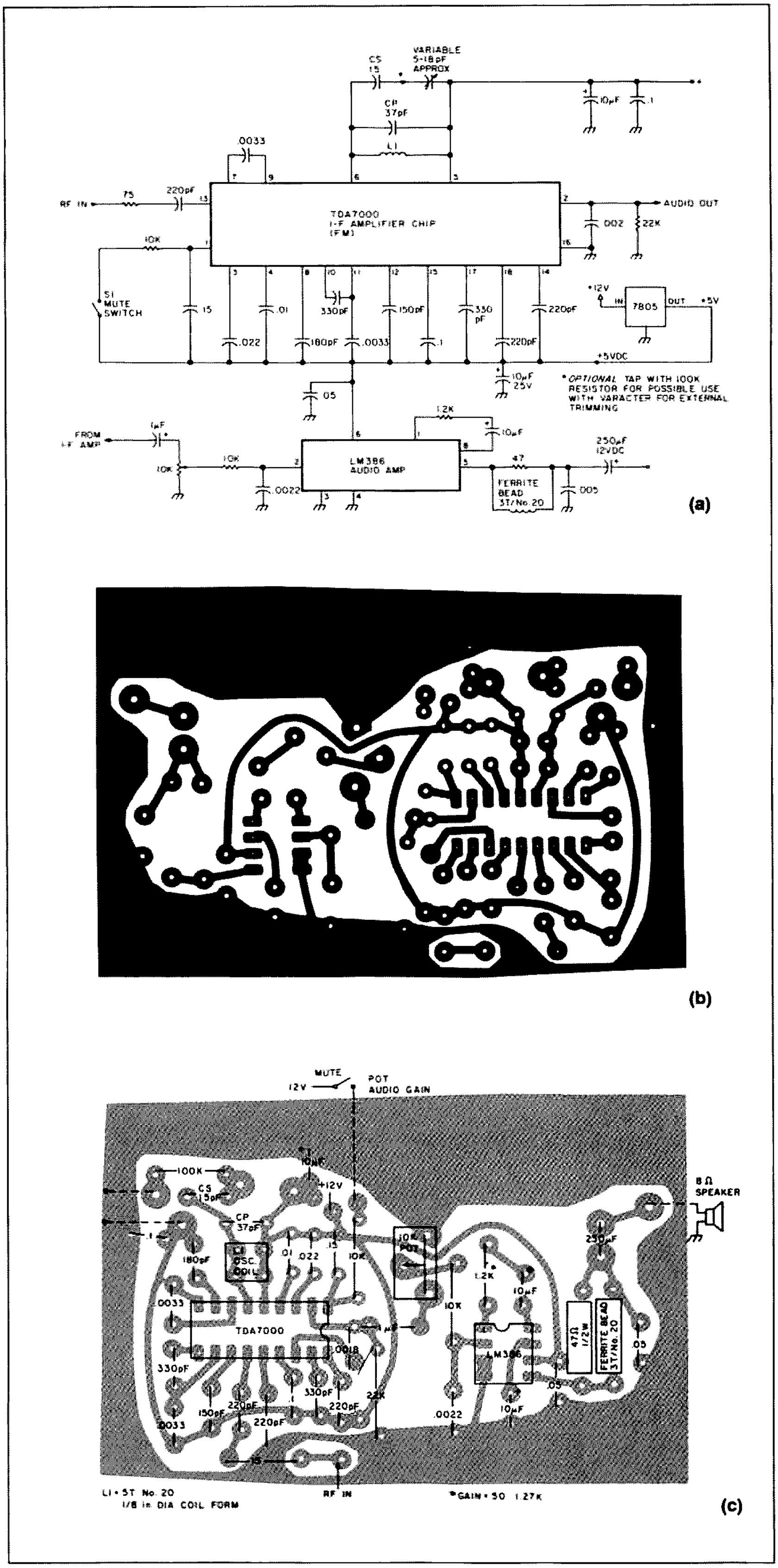


Fig. 3. 30-MHz FM receiver i-f amp (a) schematic, (b) circuit board, foil side, and (c) parts placement.

from a piece of scrap waveguide (WG-16), as described in the ***RSGB VHF Handbook***, 4th edition, Chapter 9.43, Figure 99. Anyone should be able to construct the unit with simple tools.

Safety

One word of caution with microwave devices is that you should never look into the open end of a radiating waveguide, as serious eye damage can result. With low-power Gunn diodes, the safe distance is reached in a relatively short space—say several feet—but you should still never look into one.

I-f Amplifier

The i-f amplifier that I used was first published in the October, 1986, issue of *73*. This single-chip, 30-MHz i-f amplifier with its audio output stage occupies one small PC board. The design of the i-f amplifier was modified to provide a signal-strength tuning indicator, which ties to pin 12 on the TDA7000 with an 82-pF coupling capacitor. The addition of this CA3130 op amp greatly improved the system, allowing an indication of signal strength for antenna direction and an evaluation of system performance.

The modification was made by Kerry Banke N6IZW, who mounted the circuit dead-bug fashion next to the oscillator coil on the i-f amplifier board ground foil. The results were great; with this meter circuit to evaluate this system, we had a relative quality indication to adjust our system's operation.

I have provided a circuit board for this op-amp stage to simplify construction (see Fig. 2 for the artwork and layout of the signal-strength indicator assembly). The PC

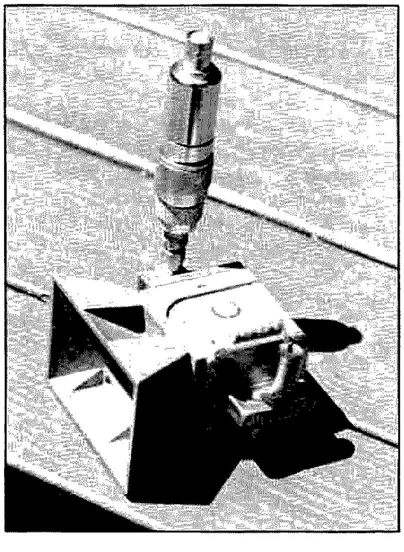


Photo D. Microwave circulator in its simplest use as a 10-GHz transceiver. This unit uses a Microwave Associates 10-mW Gunn source, a surplus circulator, a detector, and a small horn antenna. The impedance matching screw is also used for receiver "LO" injection into the detector.

board is mounted adjacent to pin 12 for short connection leads. The circuit is a simple peak detector and gives good results for tuning indications. See Fig. 3 for details on the 30-MHz i-f amplifier.

P/S Modulator

The power-supply modulator for the Gunn diode consists of a single op-amp microphone amplifier whose output is coupled to the ADJUST terminal of a variable voltage regulator. A very small change in ADJUST terminal voltage will produce a change in output voltage, causing the Gunn diode to be frequency modulated just fine. See Fig. 4 for modulator diagram and parts layout.

The power-supply modulator was used with a Radio Shack electret microphone (costing 99 cents) and attached to an alligator clip with some miniature coax—nothing said we had to use expensive components! Testing the power supply consists of making sure that the output voltage using the fixed resistors is about 8 to 8.5 volts. With a potentiometer tied from the output of the supply to ground (1 to 5k pot) and its center wiper tied to a series resistor back to the adjust terminal (3k, 1/4 W), you will be able to vary the voltage of the regulator over a range set by proper selection of the fixed 1/4-W resistor. You want the minimum voltage to be about 7 volts and the upper limit about 9.5 to 10 volts. This is the approximate range at which most Gunn diodes deliver power, and it allows a frequency-tuning control other than screws on the cavity for fine-frequency setting.

Modulation is applied in much the same manner as in the fine-frequency setting above, but follows the amplitude variations from the mike amplifier; it changes the voltage regulator ever so slightly, producing frequency modulation and deviating the Gunn diode. Needless to say, it is wide-band operation; but it is simple and it works very well.

The total system was operated from a lead-acid, 12-volt battery (2-1/2-Ah capacity), which I obtained surplus. This provided many days of operation without recharging. Normal current drawn for a Gunn diode with an output of 10 mW is 140 mA, 25 mW is 400 mA, 50 mW is 600 mA, and 100 mW is 800 mA. As you can see, with higher-output Gunn diodes, thermal considerations become very necessary and improved heat sinks are needed to dissipate the heat.

Preamplifier

The i-f preamplifier that I used was created by Jim Fisk W1HR and appeared in the October, 1978, issue of *Ham Radio*. The article listed a special transistor for the input stage, which I was not able to obtain, so I used an MRF-901. With a little taming, it worked very well. I wish I could have tried the transistors specified, as they would be the best choice for optimum performance. Several other types of transistors have also been used with good results. The output transistor that I used was a plain old 2N2222. The preamp oscillated at first; in order for the MRF-901

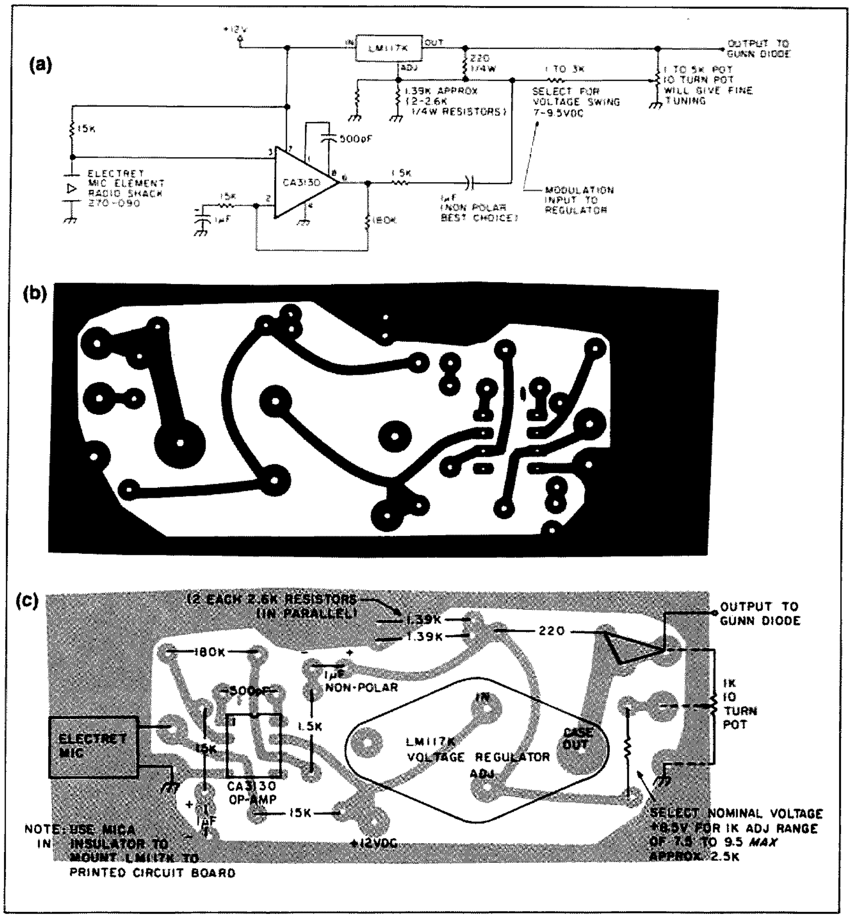


Fig. 4. Power supply modulator (a) schematic, (b) circuit board, foil side, and (c) parts placement.

transistor to be stable, its emitter lead had to be grounded right at its case. See Fig. 5 for the schematic diagram.

Many other amplifiers could be used (even the 40673 MOSFET), and I suspect most people will just pick up a pre-made 30-MHz amplifier from one of the many manufacturers of preamps. Their cost is so low it almost makes it too expensive to build one after you've gathered the parts. Whatever your choice, mount the preamplifier in a shielded box as close to the mixer diode connection as practical, keeping the leads very short to avoid stray i-f pickup.

Checkout

Each part of the system can be checked out by itself before you package the entire system. As squelch is not desired, disable the mute circuit on the i-f amplifier board by tying the 10k resistor on pin 1 of the TDA7000 amp to plus 5 volts. Couple a signal generator at 30 MHz into the amplifier and set the oscillator coil for output indication. Sensitivity should be about 2 to 3 microvolts for good quieting. Attach the preamplifier and check out its gain improvement to the system.

The completed system can be tuned up with some simple small horn antennas on a test range (I use my garage). To check the output from your Gunn diode transmitter, connect a small horn antenna to a diode detector to which a 50-microamp meter is tied. The meter reads the diode-rectified current that is developed from your transmitter. Start with your antennas spaced, say, at three feet (very small horn antennas) and find where the focus point is. Then, to tune for maximum output, secure your units with a vise or some suitable mount while you tune the adjusting screws to match your systems. If your meter is too sensitive, increase the distance between the antennas (power falls off as the square of the distance). With some experience, you can use the distance to estimate the power of your unit.

If you know that at four feet you produce 25 microamps of current with a 10-milliwatt Gunn diode and that at eight feet you get the same reading with the same antennas, you know that this source is about 100 milliwatts of power. Of course, this is a rather crude measurement, but if there is no other means of determining relative power, you use what you have available.

10-GHz Communications

Kerry N6IZW and I started out with a garage contact on 10 GHz, and before the day

was over we had worked up our distance to about three blocks. That was before we installed the i-f preamplifier. With the preamps installed, we worked a path of several miles with rock-crushing signals. The alligator clip mike worked so well we didn't change it; if you use shielded coax for the lead and a shielded box to house the components, interference should not be a problem.

With our system mounted on top of the diode mounts and the printed circuit boards unshielded for short contacts of four to five miles, it performed quite well. However, when we tried for a 15-mile path, we experienced severe FM broadcast interference feeding through the system. My system is still unshielded and I have yet to heed my own advice.

One particularly fun contact was when we went to our local San Diego swap meet and operated hand-held portable on 10 GHz. Kerry and I had mounted two 5–10-dB-gain horn antennas on the cavity for the Gunn diode transceiver and pointed them skyward while we walked around the swap meet. There were a lot of questions, and we hoped to increase interest in operation on 10 GHz. Though our contacts were short-range, we were provided with many great eyeball QSOs.

I will make Gunn diodes available to amateurs for $5 each postpaid in the continental U.S. These devices provide between 50 and 100 milliwatts of output power in a suitable Gunn mount as described in this article. The diodes are about .3 inches long—like a 3-48 screw without a head. A printed circuit board etched and ready for drilling is also available. It includes the original i-f amp, PS modulator, and S-meter circuit incorporated onto one PC board, plus the TDA-7000 chip. The cost is $10.

I would be happy to answer any questions concerning this or any other related project. Please enclose an SASE for a prompt reply. ■

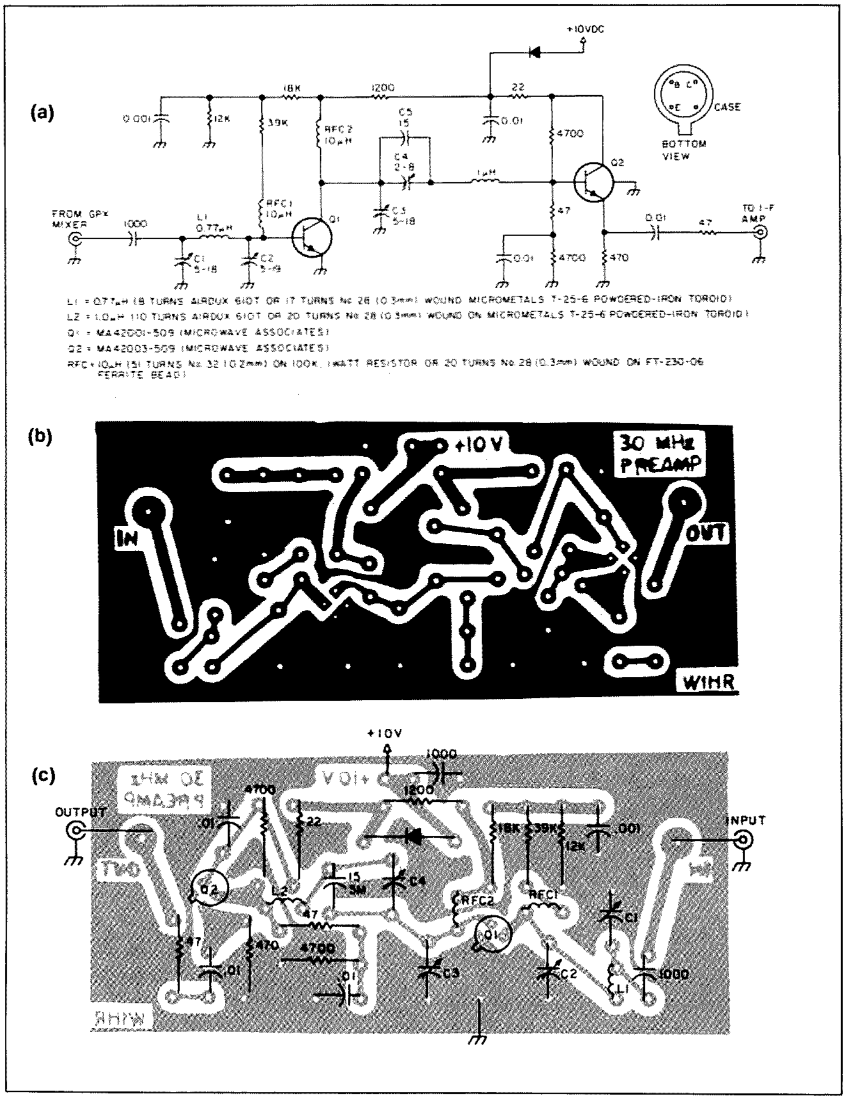


Fig. 5. 30-MHz i-f preamplifier (a) schematic, (b) circuit board, foil side, and (c) parts placement. Courtesy of Ham Radio *Magazine, J. R. Fisk W1HR, October, 1978, p. 38.*

CIRCUITS

Number 8 on your Feedback card

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (no more than two double-spaced pages) and include a clear diagram or schematic, if needed.

If your circuit is published, you will receive a one-year subscription (or extension) to 73. Submit your circuits to 73 Magazine, Editorial Offices, WGE Center, Peterborough NH 03458, Attn. Circuits.

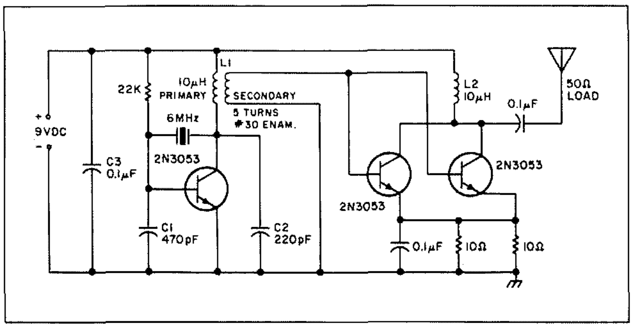


Fig. 1. One-Watt CW transmitter.

Fig. 1 is a little transmitter that could be put into a plastic Easter egg. This transmitter delivers approximately 1 Watt of measured rf output into a 50-Ohm dummy load, and creates no heating problems with the circuit. The crystal is a series fundamental type, and the power source is a 9-volt at 2-Amp supply. The transmitter can operate at another frequency, but C1 and C2 may have to be changed for it to work properly. The secondary of L1 was wound over the center of a 10-uH coil, with five turns of 30-gauge enameled wire. Most of the parts were bought at Radio Shack, except for the crystal, which came from Jameco Electronics.

James H. Brown
Rockford IL

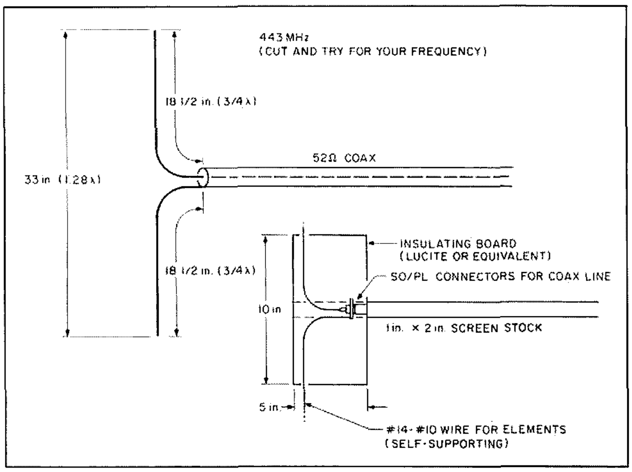


Fig. 2. 450-MHz extended double zepp.

Sometimes old-fashioned methods work. When WB4AKA wanted a super simple side-mounted transmitting antenna for his UHF repeater, he and I turned to the old extended double zepp. Handbooks show the optimum length as 1.28 wavelengths, but they also assume you will use wide-spaced tuned lines. That was typical on 40 meters in 1938, but now we are on UHF and using coax. How can we match this odd impedance?

We tried several ideas involving stubs and shorting bars and Delta matching sections, and finally reduced this to sheer simplicity with a curved matching section. It is probably theoretically a hyperbola, but any reasonably smooth curve should do. Just avoid any abrupt discontinuities (such as the Delta match offered).

Construction is easy. Cut two stiff wires (such as #10 house wire) 18-1/2″ long. This is 3/4 wavelength and thus matches the coax nicely. Then curve out from the coax connector so that the end-to-end length is 33″. This is the desired 1.28 wavelength. Slight pruning or squeezing of the curve gave us dead flat swr. You must measure to be sure. On these frequencies, there is no such thing as a cut-and-trust antenna. For different frequencies, use the same approach—3/4 wavelength legs and 1.28 overall spread.

We supported this on a 1″ x 2″ boom and a piece of insulating board (any kind will do). Cement the antenna to the board, or drill small holes and tie it on, or do whatever you like.

William Bruce Cameron WA4UZM
Temple Terrace FL

The simple design in Fig. 3 combines the functions of vfo and product detector on a single CA3028 (LM3028) IC. The Seiler oscillator (configured for 30 meters, but scalable) is varicap-tuned to provide about a 35-kHz range, and has good tuning linearity and better band-spread than a tuning capacitor because a pot has a 270-degree tuning range. Compact or spread the turns on L1 to trim the frequency into the band, then coat them with dope. Use NPO capacitors for best stability. Vfo pulling is minimal under strong signal conditions. Balanced input at T1 minimizes vfo radiation into the antenna. Use this in your next direct-conversion receiver, or add the circuitry for offset and buffering in your next QRP transceiver design.

Chris Iwata KL7DM
Anchorage AK

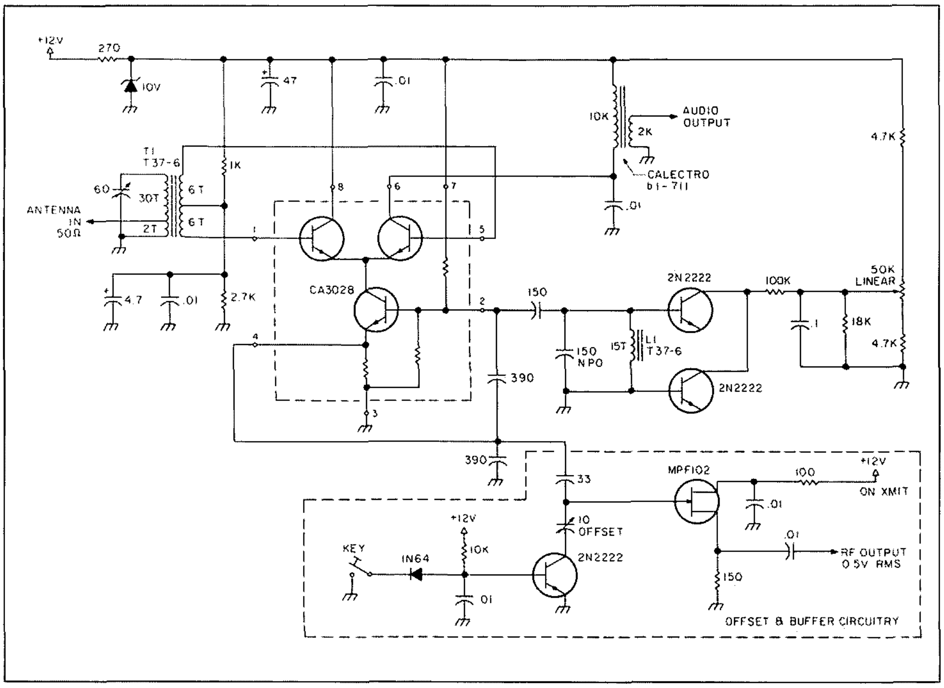


Fig. 3. Vfo/product detector on a chip.

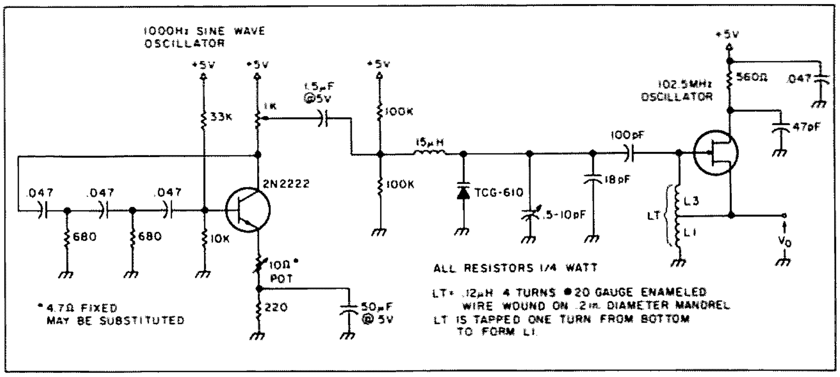


Fig. 5. A one-transistor FM transmitter.

While employed at Pegasus Data Systems, I was asked to design a simple, convenient, low-cost FM transmitter that could test a large number of vendor-supplied FM receivers that were to be incorporated into a digital data-transmission system. The transmitter had to make a subjective check of the accuracy of the tuning-dial setting and the sensitivity of each receiver unit. Since it might become necessary to perform field tests, interconnecting various pieces of bulky and heavy test equipment was an undesirable alternative.

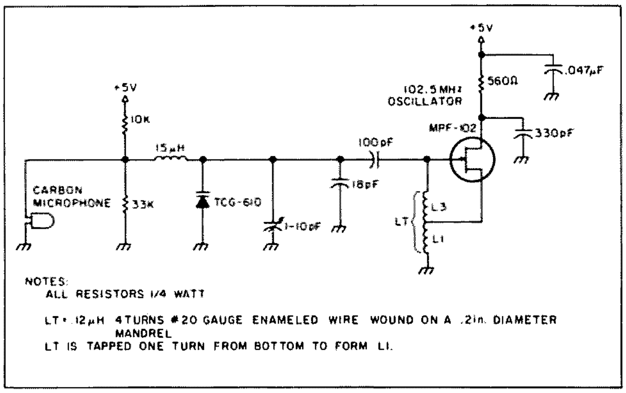


Fig. 6. Modified transmitter, using a carbon microphone.

To meet the requirement, I designed, built, and tested the transistor circuit shown in Fig. 5. The 2N2222 circuitry is a three-element phase-shift oscillator circuit, designed to yield a 1,000-Hz sine wave. The 1,000-Hz sine wave is then applied to the TCG-610 varactor diode (6 pF at 4 volts), which changes the tank capacitance, thus varying the rf oscillator frequency at a 1,000-Hz rate. The 1,000-Ohm potentiometer in the collector circuit may be adjusted to enable the desired frequency modulation level.

The Hartley rf oscillator, designed around a readily available MPF-102 JFET, has an output that should be relatively stable if it is enclosed in a metal box (thus minimizing changes in tank capacitance). The completed transmitter has a range of 30 feet when not enclosed (but without an antenna). When enclosed, a BNC or F connector can be used to feed the rf to a small loop. If you decide to build this unit, be careful, the FCC has regulations regarding the radiation of rf.

One of my colleagues, Bohdan Stryzak, modified the transmitter by eliminating the sine-wave-oscillator portion and replaced it with a carbon microphone as shown in Fig. 6. This created for his children a three-dollar portable transmitter that could be used with any portable FM receiver as a handie-talkie.

William Rynone, PhD
Annapolis MD

1987 WORLD SSB CHAMPIONSHIPS

Announcing the January Classics—the 1987 running of the World SSB Championships! The first and only contests of their kind, these six individual single-band events are world-renowned and amongst the most challenging events on the bands today. Winners of each contest determine the World Champion for 10-, 15-, 20-, 40-, 75-, and 160-meter single sideband:

0000 UTC January 3, 1987
through 2400 UTC January 4, 1987
1st 10-Meter World SSB Championship

January 10, 1987
0000–2400 UTC
3rd 15-Meter World SSB Championship

January 11, 1987
0000–2400 UTC
3rd 20-Meter World SSB Championship

0000 UTC January 17, 1987
through 2400 UTC January 18, 1987
8th 160-Meter World SSB Championship

January 24, 1987
0000–2400 UTC
6th 40-Meter World SSB Championship

January 25, 1987
0000–2400 UTC
6th 75-Meter World SSB Championship

MISC. RULES:

Stations may be worked only *once per event*. All contacts must be two-way SSB transmissions. All stations, regardless of their operating class, may operate entire contest periods without a rest period.

OPERATOR CLASS:

(a) Single operator, single transmitter, SSB only. (b) Multi-operator, single transmitter, SSB only.

EXCHANGE:

Stations within the continental 48 U.S. states and 13 Canadian provinces or territories transmit RS report and state, province, or territory. All others, including Alaska and Hawaii, transmit RS report and DX country.

QSO POINTS:

5 QSO points for contact within your own continent, 10 QSO points for contact outside your own continent.

MULTIPLIER:

1 multiplier point is earned for each continental U.S. state (48 max.), Canadian province or territory (13 max.), or ARRL DXCC country (excluding the United States or Canada).

DX WINDOW:

For the purpose of this event, DX window frequencies are reserved for *split-frequency operation only*. W/VE stations are not to transmit in the DX window. DX stations may transmit in the DX window but *must* receive *outside* window frequencies. DX Windows: 7.080–7.090, 3.790–3.805, 1.825–1.830, 1.850–1.855, and 1.907–1.913 MHz.

FINAL SCORE:

Total QSO points x multiplier points = claimed score.

CONTEST ENTRIES:

Entries must include (1) a contest log, (2) a dupe sheet for 100 or more contacts, (3) a list of multipliers, and (4) a summary sheet as outlined below. Be sure to include your soapbox comments and a black-and-white photo for possible publication.

SUMMARY SHEET:

Summary Sheets must contain (1) contest callsign, (2) your QTH, (3) station owner's name and address, (4) a list of station equipment and antennas, (5) operator class, (6) total QSO points, (7) total U.S. states worked, (8) Canadian provinces and territories worked, (9) the total of ARRL DXCC countries worked, (10) total multiplier points, (11) claimed score, and (12) if a multi-operator station, a list of participants, by callsign.

ENTRY DEADLINE:

Mail contest entries separately to the contest chairman listed below. Entries must be *postmarked no later than February 18, 1987*. Late entries will be registered as check logs.

DISQUALIFICATION:

Contestants may be disqualified if they run illegal power, cause deliberate interference, fail to comply with the DX window rules, attempt to achieve a scoring advantage, or if the number of duplicate contacts not cancelled exceeds more than 3% of the total contacts made. Contest committee decisions are final.

PENALTIES:

A penalty of 100 QSO points will be assessed for *each* duplicate contact counted in a contestant's claimed score.

AWARDS:

A minimum of 100 QSOs must be worked in an event to be eligible for certificates. Plaques will be issued to World Championship stations who work a minimum of 500 contacts. Awards will be issued in each operator class, in each continental U.S. state, Canadian province and territory, and ARRL DXCC country represented.

RULES AND FORMS:

Contestants are encouraged to *send an SASE* for official forms to:

Bill Gosney KE7C
World Championship Contests
2665 North Busby Road
Oak Harbor WA 98277

Mail each entry to the appropriate contest chairman:

10-Meter Contest Chairman
Linda Ingram KG6MO
44720 N. 11th Street East
Lancaster CA 93535

15-Meter Contest Chairman
Gary Vest NW5E
Star Route, Box 34
Holliday TX 76366

20-Meter Contest Chairman
Chuck Ingram WA6R
44720 N. 11th Street East
Lancaster CA 93535

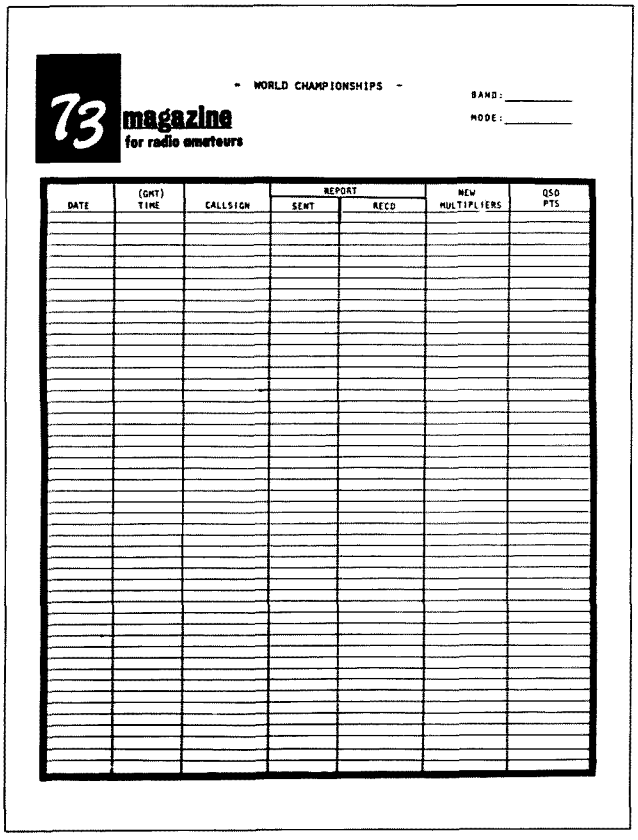
40-Meter Contest Chairman
Dennis Younker NE6I
43261 6th Street East
Lancaster CA 93535

75-Meter Contest Chairman
Ron Johnson KC7PA
68 South 300 West
Brigham City UT 84302

160-Meter Contest Chairman
Bill Gosney KE7C
2665 N. Busby Road
Oak Harbor WA 98277

N5AU, KS9O, ZS6BPL, and NP4P —40-Meter World Champions—

This year was a typical Texas standoff! N5AU became the World Single-Operator Champion by depriving two-time record holder KE5CV of his third consecutive world title. KE5IV, last year's runner-up, had to settle for third place this time around. All three Lone Star stations were neck and neck in the closing hours of the contest. Guess it's true that



73 magazine for radio amateurs

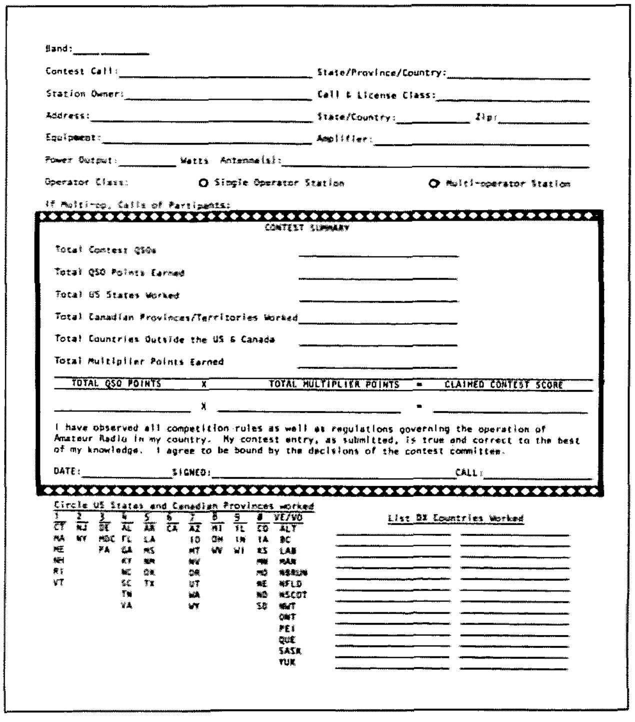
- WORLD CHAMPIONSHIPS -

BAND: ________

MODE: ________

DATE	(GMT) TIME	CALLSIGN	REPORT SENT	REPORT RECD	NEW MULTIPLIERS	QSO PTS

Sample log sheet.



Band: ________

Contest Call: ________ State/Province/Country: ________

Station Owner: ________ Call & License Class: ________

Address: ________ State/Country: ________ Zip: ________

Equipment: ________ Amplifier: ________

Power Output: ________ Watts Antenna(s): ________

Operator Class: O Single Operator Station O Multi-operator Station

If Multi-op, Calls of Participants:

CONTEST SUMMARY

Total Contest QSOs ________

Total QSO Points Earned ________

Total US States Worked ________

Total Canadian Provinces/Territories Worked ________

Total Countries Outside the US & Canada ________

Total Multiplier Points Earned ________

TOTAL QSO POINTS X TOTAL MULTIPLIER POINTS = CLAIMED CONTEST SCORE

________ X ________ = ________

I have observed all competition rules as well as regulations governing the operation of Amateur Radio in my country. My contest entry, as submitted, is true and correct to the best of my knowledge. I agree to be bound by the decisions of the contest committee.

DATE: ________ SIGNED: ________ CALL: ________

Circle US States and Canadian Provinces worked

1	2	3	4	5	6	7	8	9	Ø	VE/VO
CT	NJ	DE	AL	AR	CA	AZ	MI	IL	CO	ALT
MA	NY	MDC	FL	LA		ID	OH	IN	IA	BC
ME		PA	GA	MS		MT	WV	WI	KS	LAB
NH			KY	NM		NV			MN	MAN
RI			NC	OK		OR			MO	NBRUN
VT			SC	TX		UT			NE	NFLD
			TN			WA			ND	NSCOT
			VA			WY			SD	NWT
										ONT
										PEI
										QUE
										SASK
										YUK

List DX Countries Worked

Sample summary sheet.

everything's big in Texas, including the scores!

N5AU led KE5CV by only 136 QSOs at the finish, enough to outweigh the multipliers earned by his second-place rival. Both stations had 56 states and provinces; however, Mike KE5CV held the advantage in DX countries worked—37 to N5AU's 32.

KS9O became the unchallenged Multi-Op Champion with a total of 1,031 QSOs, 57 states and provinces, 23 DX countries, and a total score of 424,000 points. K3TUP, World Champion for the past three years, apparently wasn't able to turn out but did manage to get some activity in on the other events. KS9O had smooth sailing throughout the contest. Following by a wide margin was well-known 15/20-meter World Champ, K5LZO—another one of those Texas powerhouses! Hi, Chuck!

ZS6BPL earned the World Championship for DX single-op stations with 400 QSOs, 44 states, and 43 DX countries, while Puerto Rican station NP4P took multi-op honors for the event. ZS6BPL had the greatest competition to face. He and I4RYC had identical multiplier counts of 87 and ZS6BPL led by only 44 QSOs. The key factor: ZS6BPL worked more stations out of his own continent. NP4P took a comfortable lead at the very start and remained unchallenged throughout the evening. As Table 2 shows, this is the first year the world multi-op championship has been awarded outside Italian borders. Will Italy get it back next year?

In championship level competition, it is no surprise when someone breaks a world record. This year is no exception. N5AU and KE5CV both surpassed the world 40-meter QSO record established last year.

Single Operator:

N5AU	1986	1,397
KE5CV	1986	1,261
KE5CV	1985	1,200
K4XS	1985	1,196
KE5IV	1986	1,151
W1WEF	1984	1,042
KE5CV	1984	1,020
N6YK	1985	1,012
VE5DX	1982	972
KE5IV	1984	953

Multi-Operator:

K3TUP	1985	1,381
K3TUP	1983	1,214
K3TUP	1984	1,196
N4DDS	1985	1,151
KYØS	1985	1,139
K8ND	1983	1,129
N9NB	1982	1,098
W2ZQ	1985	1,064
KS9O	1986	1,031
K9EC	1984	1,008

As always, Canadian multipliers were at a premium. VE1s, VE5s, and VE8s (Bob VE8DX, where were you?) were about as rare as Clipperton Island. Stations with 50 or more states and provinces to their multiplier credit include: KS9O (57); NK7U, N5AU, KE5CV, KE5IV, and KVØI (56 each); K5LZO, K6HNZ, and KQ1F (55); NC9F, K1KJT, and WI4R (54); W8RA, WA3SPJ, and N2BOW (53); N6AOI and KA7DLV (52); NC2V, WA2HFI, and WD4KXB (51); and NT5D (50).

DX country multipliers were extremely hard to find. Six months before the contest announcements were mailed to more than 50 publications worldwide. The contest was well publicized, yet it seems we still have to convince DX stations to work split-frequency—to listen for stations above 7.150 MHz. Leading the field with 30 countries or more were: DJ3HJ (53), I4RYC (51), ZS6BPL (43), KE5CV (37), JA3YKC (36), N5AU (32), W8RA and W6MKB (31), and KE5IV (30).

Speaking of split-frequency, it is worth noting that many stations are not observing the DX window frequencies as they were intended for this contest. *DX stations may only transmit and non-DX stations may only listen in the DX windows.* Unfortunately, this rule has been either misinterpreted or ignored by some stations and we had to disqualify them. We hated to do it, but rules are rules, and the integrity of these Championship events cannot allow deviations or special allowances.

Being an antenna nut myself, I look forward to conducting the antenna survey each year. With the help of Contest Chairman NE6I, here are the tabulated results extracted

40-meter world single-op DX champion ZS6BPL.

Overall Winners—Single Operator:

USA	KE5CV	85	704,520
Canada	VE3MFP	85	227,420
DX	ZS6BPL	86	340,605

Overall Winners—Multi-Operator:

USA	K3TUP	85	597,240
Canada	VE2ZP	82	86,355
DX	I4KDJ	84	545,090

W/VE Stations—Single Operator:

AL	KA4RKD	82	16,080
AR	KDØHY	86	68,000
AZ	WB7APW	85	132,370
CA	N6YK	85	539,400
CO	K9MWM/Ø	84	239,600
CT	W1WEF	84	434,320
DE	AC3T	86	123,300
FL	K4XS	85	567,840
GA	K4JPD	84	197,210
IA	KDØHY	85	99,680
ID	KJ7R	82	9,333
IL	KB8AC	85	95,410
IN	N9GT	85	236,375
KS	NØCLV	85	28,595
KY	KD4TQ	84	214,620
LA	NS5Z	85	64,435
MA	KA1GG	85	303,680
MD	K3ZO	86	72,610
ME	KS1G	84	62,405
MI	N8CXX	85	202,620
MN	KA7DLV	86	129,640
MS	AE5H	85	142,680
MT	KS7T	85	35,860
NC	W4TMR	84	140,080
NE	KØHA	85	338,000
NH	AK1A	85	103,740
NJ	NC2V	85	344,520
NM	W5TTE	85	74,800
NV	KD7SP	85	75,330
NY	WA1BBB	85	108,330
OH	WD8IVL	84	187,860
OK	N5AFV	85	21,800
OR	KI7M	84	207,025
PA	KI2G	84	236,250
RI	KA1SR	85	98,820
SC	W4TWW	85	13,440
TN	N4JII	85	137,200
TX	KE5CV	85	704,520
UT	KC7PA	85	77,000
VA	WD4KXB	86	122,220
VT	KT1J	84	106,335
WA	N7EMX	84	20,600
WI	K9EC	85	317,560
WV	NJ8N	86	225,455
WY	KB7M	85	43,665
ALT	VE6CPP	86	8,190
BC	VE7BBD	86	2,945
LAB	VO2CW	83	29,326
MAN	VE4RP	83	9,576
NB	VE1AJJ	82	9,308
NS	VE1NG	86	65,280
ONT	VE3MFP	85	227,420
QUE	VE2YU	85	39,480
YUK	VY1CW	86	1,860

W/VE Stations—Multi-Operator:

CA	KE6WA	84	188,430
CO	KYØS	85	512,940
FL	WA4JXI	85	468,585
IL	KS9O	86	424,000
IN	N9NB	82	112,965
KY	KD4TQ	82	95,432
LA	KD5RW	86	43,930
MI	W8RA	86	317,100
NC	NW4B	84	433,875
NJ	W2ZO	85	359,700
NY	N2EIK	84	66,865
OH	K8ND	83	113,646
OR	NK7U	86	319,125
PA	K3TUP	85	597,240
RI	KK1B	84	17,820
SD	KBØQA	84	173,565
TN	N4DDS	85	385,770
TX	WD5GSL	85	342,005
VA	NA4L	84	342,735
VT	WB1GMH	83	9,898
WA	KE7C	84	48,900
WI	K9EC	84	449,360
WY	KB7M	84	19,075
QUE	VE2ZP	82	86,355

DX Stations—Single Operator:

Alaska	KL7U	85	187,000
Australia	VK5BW	82	13,158
Austria	OE1WWL	84	14,580
Brazil	PY5EG	83	69,064
Bulgaria	LZ1KKA	85	17,640
Cayman Is.	ZF2GO	85	30,590
Ceuta	EA9KQ	84	39,565
Czech.	OK1TN	84	137,610
Denmark	OZ3ZK	85	3,920
Dom. Rep.	HI4AGE	82	24,603
East Germany	Y33TA	84	22,080
Ecuador	HC1OT	86	74,790
England	G4IVJ	84	14,260
France	FE6BVB	85	6,375
Guam	KD7P/KH2	84	228,200
Hawaii	KH6DW	88	27,170
Honduras	HR1FC	85	34,860
Indonesia	YCØDPO	86	34,580
Israel	4X6DK	84	10,030
Italy	I4RYC	86	270,570
ITU/Geneva	4U1ITU	84	167,440
Japan	JH3TKM	84	41,085
Korea	HL1ABR	86	4,585
Luxemberg	LX1JX	84	48,345
Montserral	K3WGR/VP2M	85	176,175
Morocco	CN8CO	82	61,008
Netherlands	PA3CEF	85	600
New Zealand	ZL1BQD	84	90,630
Norway	LA5YF	82	32,319
Philippines	KF6ME/DU	85	45,960
Poland	SP9FIH	86	6,100
Portugal	CT4NH	83	74,888
Romania	YO9CUF/3	82	230
Solomon	H44SH	82	37,765
So. Atrica	ZS6BPL	86	340,605
Spain	EA3CCN	84	76,250
Sweden	SM4CAN	82	690
Venezuela	4M3AZC	83	124,805
West Germany	DJ3HJ	85	284,375
Yugoslavia	YU3CK	85	20,200

DX Stations—Multi-Operator:

Alaska	AL7DX	84	34,125
Australia	VK6IR	85	128,750
Costa Rica	TI2DCR	86	39,790
Czech.	OK1KSO	84	307,020
England	GØAGH	86	1,595
Italy	I4KDJ	84	545,090
Japan	JA7YFB	85	19,075
Korea	HL9FY	84	20,200
Puerto Rico	NP4CC	84	217,005
West Germany	DL8NBE	84	194,220

Table 1. 40-meter honor roll—all-time record holders. (Columns show QTH, callsign, year, and score.)

1986 40-METER WORLD SSB CHAMPIONSHIP

Callsign, QTH, QSOs, states and provinces, DX countries, total score
** = World Champions; * = State, Province, Country Champions

W/VE—Single Operator:

** N5AU	TX	1,397	56	32	641,080
* KE5CV	TX	1,261	56	37	626,355
KE5IV	TX	1,151	56	30	530,620
* K6HNZ	CA	737	55	21	319,960
* KQ1F	MA	839	55	14	292,215
NR5M	TX	674	55	23	281,190
* NC2V	NJ	782	51	12	251,055
K1KJT	MA	667	54	14	230,180
* KVØI	NE	748	56	4	225,600
* NJ8N	WV	666	54	13	225,455
W6MKB	CA	380	47	31	190,320
N2BOW	NJ	516	53	17	185,150
N6ADI	CA	366	52	26	169,650
* WI4R	GA	515	54	11	168,675
* N4EJV	FL	418	48	22	154,350
* KA7DLV	MN	462	52	4	129,640
* AC3T	DE	407	50	10	123,300
* WD4KXB	VA	382	51	12	122,220
W4WKQ	FL	439	49	5	119,340
* NE8T	MI	389	49	8	112,005
WA2HFI	MN	410	51	2	108,650
* VE3BVD	ONT	322	42	18	106,200
WA2YLY	NJ	360	45	4	88,445
* KA1SR	RI	301	43	10	80,030
* W4TMR	NC	259	46	13	79,650
* K3ZO	MD	262	42	11	72,610
* KDØHY	AR	268	45	5	68,000
* VE1NG	NS	190	43	21	65,280
* KC4TX	KY	200	47	12	63,425
K5FUV	AR	203	41	11	54,340
* W3ARK	PA	242	43	1	53,240
WA6FGV	CA	217	45	3	52,320
K5HSL	TX	200	43	5	49,920
K5GN	TX	204	45	2	48,175
* NØBSA	CO	187	44	6	47,250
* KE7KF	UT	230	34	5	46,215
* W3SOH	VT	216	40	2	45,360
* N4HQT	TN	239	36	0	43,020
* KA2VAJ	NY	214	38	2	42,800
* KQ9Z	IN	205	37	3	41,200
* KN1M	ME	155	38	6	34,760
KI4UJ	KY	138	38	4	29,610
KF4HK	NC	106	37	5	22,680
* KB8KW	WY	102	39	4	22,575
* KA9BQA	IL	122	36	1	22,570
WØNGB	MN	104	42	1	22,360
K5ZD	MA	93	33	8	20,090
* W1WEF	CT	100	38	1	19,695
K8KUH	MI	94	34	3	17,575
W3RGX	MD	88	37	2	17,355
* W9MQZ	WI	103	33	0	16,995
KC7PA	UT	101	26	4	15,600
K4GKV	GA	81	31	5	15,120
WA5IYX	TX	76	36	2	14,630
* KA7STQ	OR	100	26	2	14,100
WK4F	FL	71	33	3	13,320
W9REC	IL	61	33	0	10,065
W8VEN	WV	64	29	1	9,600
K7LXC	WA	63	30	0	9,450
NE6I	CA	73	21	3	8,880
VE6CPP	ALB	63	26	0	8,190
N5AFV	TX	55	26	2	7,840
KF1B	CT	52	25	2	7,020
KD5SA	TX	32	19	0	3,040
VE7BBD	BC	31	18	1	2,945
VY1CW	YUK	26	10	2	1,860
K2SCU	TX	20	11	5	1,840
WA3JXW	PA	15	10	0	750
K1NCD	CT	14	9	0	630
W3FQE	MD	3	3	0	45

(Checklog: K6FM.)

DX—Single Operator:

** ZS6BPL	South Africa	400	44	43	340,605
* I4RYC	Italy	366	36	51	270,570
* DJ3HJ	West Germany	227	7	53	91,800
* HC1OT	Ecuador	141	32	22	74,790
4M5J	Venezuela	91	25	19	36,520
* YCØDPO	Indonesia	192	0	19	34,580
KH6DW	Hawaii	74	27	11	27,170
JR6EZE	Japan	69	2	25	15,525
SP9FIH	Poland	55	0	20	6,100
Y43GO	East Germany	56	0	19	5,320
Y24MB	East Germany	52	0	18	4,770
Y54NL	East Germany	54	0	17	4,675
* HL1ABR	Korea	128	1	6	4,585
OK1KZ	Czechoslovakia	55	0	15	4,200
OZ1DPW	Denmark	36	0	14	2,590
LZ2QV	Bulgaria	36	0	13	2,535
Y78XL	East Germany	27	0	14	1,540
OK1AJN	Czechoslovakia	25	0	11	1,485
Y36NC	East Germany	27	0	10	1,350
JA1YAG	Japan	17	3	5	1,280
I4CSP	Italy	17	0	17	1,235
EA3ALM	Spain	21	0	10	1,150
EA3BOX	Spain	17	0	9	765
OK3YK	Czechoslovakia	19	0	8	760
YU7SF	Yugoslavia	17	0	8	680
Y32KE	East Germany	14	0	9	675
Y22WF	East Germany	17	0	6	510
JE1GZB	Japan	7	2	2	260
JH3DEJ	Japan	5	0	4	160
OK2BHQ	Czechoslovakia	7	0	4	140
Y34OL	East Germany	7	0	3	105
JA2MNB	Japan	3	0	3	90
OK2ABU	Czechoslovakia	4	0	3	60
JA1KFX	Japan	3	1	1	60
LZ1BJ	Bulgaria	3	0	3	45
Y59ZF	East Germany	3	0	3	45
JR4ISK	Japan	2	0	2	20

(Checklogs: Y32UC, Y38YK, and Y55YF.)

W/VE—Multi-Operator:

** KS9O	IL	1,031	57	23	424,000
* K5LZO	TX	674	55	27	320,620
* NK7U	OR	831	56	19	319,125
* W8RA	MI	718	53	31	317,100
* WA3SPJ	PA	703	53	25	287,820
NT5D	TX	633	50	26	253,080
* NC9F	IL	737	54	12	245,190
K5MR	TX	425	49	19	153,680
* WA6HRH	CA	337	48	16	115,520
* KD5RW	LA	189	41	5	43,930
WV2ZOW	NJ	71	30	3	11,715

DX—Multi-Operator:

** NP4P	Puerto Rico	453	48	28	183,920
* TI2DCR	Costa Rica	169	35	11	39,790
JA3YKC	Japan	67	2	36	26,980
JA9YBA	Japan	53	7	13	10,000
JAØYAK	Japan	32	2	14	4,320
JA2YEF	Japan	23	2	13	3,150
GØAGH	England	29	0	11	1,595

Multi-Operator Participants:

GØAGH	GØAGH, G4XOM, G4IEB
JA2YEF	JI2LPD, JI2OVF, JI2SIC, JJ2VFE, JR2PVI
JA3YKC	JI3ERV, JL3ERV, JR6NWN
JA9YBA	JA9VDA, Mia Takagi
JAØYAK	JHØELL, JHØUSD
NP4P	NP4P, NP4Z
TI2DCR	TI2DCR, TI2KTY
WV2ZOW	WV2ZOW, WB2TIX
WA3SPJ	WA3SPJ, KS3F
K5MR	K5MR, N5RZ
KD5RW	KD5RW, KA5DLM, KA5BOO
K5LZO	K5LZO, KA5SBS, WB5RUS
NT5D	NT5D, WB5N, NM5M
WA6HRH	WA6HRH, KG6JE, N6KUY, N6LJK, KB6JWV
NK7U	NK7U, NI7T
W8RA	W8RA, NF8C
NC9F	NC9F, W9HUW, WB9IPW, W9JB, G4UTB/W9
KS9O	KS9O, NB9T, KA9DVY

40-METER SOAPBOX

DJ3HJ	Very strong storm pulled antennas down.
OZ1DPW	First contest I've been in; certainly not my last!
SP9FIH	Pity that I don't have a remote vfo to work split frequency to the USA.
VY1CW	Someday we will have 24 hours of good propagation up here.
N2BOW	Great contest, good scheduling. No football TVI!
NC2V	Poor band conditions + big head cold = low score.
KA2VAJ	Conditions so-so.
WA3SPJ	Never got a European opening.
WD4KXB	Very few DX stations would listen up. Overall an enjoyable contest.
WI4R	First time in the contest. Had a good time though DX conditions were the poorest I have ever seen.
W4TMR	As always, an excellent contest. Looking forward to returning next year.
W4WKQ	A very FB contest!
WA5IYX	Biggest thrill was finally getting a ZS6 on 40 meters.
KA7DLV	I was amazed at all the activity that persisted clear up to the very end of the contest.
K7LXC	50 QSOs in last 20 minutes—whew!
NC9F	About 0600 the power in the neighborhood failed. You can imagine the looks we got from the neighbors. They assumed we caused it.
W9MQZ	Enjoyed the contest very much.
KVØI	First time I finished WAS so early in the contest.

	1982	1983	1984	1985	1986
W/VE Single Op:	VE5DX	KC5NO	KE5CV	KE5CV	N5AU
W/VE Multi-Op:	N9NB	K3TUP	K3TUP	K3TUP	KS9O
DX Single Op:	YV5ANE	4M3AZC	KD7P/KH2	DJ3HJ	ZS6BPL
DX Multi-Op:	I4YNO	I5NPH	I4KDJ	I4KDJ	NP4P

Table 2. 40-meter world champions.

Single Op:				
N5AU	TX	Unknown at press time		
KE5CV	TX	TS-930S	Alpha 77D	four 3-element yagis
KE5IV	TX	TS-930S	Alpha 77DX	two 4-element yagis
K6HNZ	CA	TS-930S	Alpha 76PA	2-element yagi
ZS6BPL		Home-brew	Home-brew	2-element yagi
Multi-Op:				
KS9O	IL	C-line	SB-220	3-element yagi
K5LZO	TX	TS-430S	Alpha 76A	4-element yagi
NK7U	OR	TS-930S	Alpha 78	4-element yagi
W8RA	MI	TS-180	SB-220	3-element yagi
WA3SPJ	PA	TS-830	Alpha 76PA	3-element yagi

Table 3. Equipment of the top-five single- and multi-op 40-meter stations.

from this year's entries, showing the antennas used in the 40-meter contest and their percentages:

Inverted vee/dipole	37.5
Vertical	16.5
2-element yagi	11.5
3-element yagi	9.5
4-element yagi	9.5
Miscellaneous wire arrays	5.5
Delta loop	2.5
G5RV	2.5
Rotary dipole	2.5
Half-wave sloper	2.0
Folded umbrella	.5

So how does your station compare? Are you like me, going to add another element next year? Right on. Check out last year's survey. The results are quite similar. For the most part, World Champions run 4-element arrays, while state or provincial winners use dipoles.

Table 3 compares your station to the top five in each category. Let's see what makes a championship station besides a darn good operator.

This year saw some new records established. Glance through Table 1, the honor roll list of 40-meter world-record holders. I'm sure you'll recognize some of the stations listed. Perhaps next year, your call will lead the list for your state, province, or country. Plan your attack and go for it!

On behalf of 40-meter Contest Chairman Dennis Younker NE6I: Thank you all for your dedication to the band and for the support given our events year after year. A standing ovation to our four World 40-Meter Champions: N5AU, KS9O, ZS6BPL, and NP4P. ■

Look for the 20- and 15-Meter World Championship results in the February issue.

SPECIAL EVENTS

SOUTH BEND IN
JAN 4

A Hamfest Swap 'N' Shop will be held on January 4 at Century Center, downtown on U.S. 33, oneway, north between the St. Joseph Bank Building and the river, in South Bend, Indiana. Four-lane highway to the door from all directions. Tables: $5/5-foot round, $10/8 x 2.5 rectangular, $2/ft. wall locations. Talk-in on .52, .99/.39, .93/.33, .69/.09, 142.29. For more information, contact Wayne Werts K9IXU, 1889 Riverside Drive, South Bend IN 46616; (219)-233-5307.

MILWAUKEE WI
JAN 10

The West Allis ARC will sponsor the 15th annual Mid-Winter Swapfest on January 10, from 8 a.m. to 3 p.m., at the Waukesha Co. Expo Center Forum. Directions: I-94 to Co. J, south to FT, west to expo. Admission is $2 in advance, $3 at the door. Tables (4-foot): $3 in advance, $4 at the door. Advance deadline is January 2. Amateur exams given. For tickets or information, write to WARAC Swapfest, PO Box 1072, Milwaukee WI 53201 (SASE please).

ROBERT E. LEE'S B'DAY
JAN 17-18

The Confederate Signal Association of South Mississippi will operate a special-event station on January 17-18 to celebrate Robert E. Lee's birthday. Operation times will be 1800 UTC Saturday to 1900 UTC Sunday. The frequencies planned are 21.150, 21.350, 28.150, 28.350, 50.150, 144.150, and 432.150. QSL via W. R. Jeffrey KA4CRT, PO Box 923, Gulfport MS 39502-0923.

HOSARC DOUBLE 7
JAN 18

The Hall of Science ARC will issue a commemorative certificate to anyone working a HOSARC station on January 18, in celebration of its 14th anniversary. HOSARC stations using the call WB2JSM will operate SSB in the 40- and 20-meter General phone bands, and CW in the 40- and 15-meter Novice bands, from 1500 to 2100 UTC. QSL with a large SASE (44¢ or one IRC) to: HOSARC OSL Manager, Arnie Schiffman WB2YXB, 81-22 250th Street, Bellrose NY 11426.

MICHIGAN 150TH
JAN 25

The Oakland County ARS will operate W8TNO on January 25, from 1600 to 0000 UTC, to celebrate the 150th anniversary of the state of Michigan. Operation will be on 20 through 80 meters, SSB and CW. Suggested frequencies are 14.270, 7.270, and 3.870; CW—7.130 and 3.730. For a special certificate, send a 9 x 12 SASE to W8TNO.

YONKERS NY
JAN 25

The Yonkers ARC will sponsor its Electronics Auction on January 25, from 9 a.m. to 3 p.m., at Lemko Hall, 556 Yonkers Avenue, Yonkers, New York. Inspection from 9-10 a.m.; auction starts at 10 a.m. sharp. Admission is $3, children under 8 free. Club commission on successful sales only: 10% on first $100, 5% on remainder. Talk-in on 146.865, 440.150, or 146.52. For more information, contact YARC, 53 Hayward Avenue, Yonkers NY 10704; (914)-969-1053.

GREENVILLE AL
JAN 25

The Butler County ARC will hold its annual Hamfest on January 25, from 8 a.m. until 2 p.m., at the Greenville, Alabama, Recreation Center.

SOUTHFIELD MI
JAN 25

The Southfield High School ARC is sponsoring its 20th annual Swap and Shop on January 25, from 8 a.m. to 3 p.m., at Southfield High School. Admission is $3. Reserved tables are $20 for two 8-foot tables (paid in advance). Additional reserved tables are $10 each. Tables will also be available at the door. Please reserve tables and tickets in advance and specify if you need electrical outlets and wall space. All table reservations will be confirmed. For more information or reservations, write to Robert Younker, Southfield High School, 24675 Lahser, Southfield MI 48034.

MARSHALL ISLANDS
JAN 31-FEB 9

The Kwajalein ARC will operate KX6BU from 0600 UTC January 31 until 0600 UTC February 9 to commemorate the 43rd anniversary of the Battle of Kwajalein and Roi-Namur. Frequencies: SSB—14.250, 21.350, 28.550; CW—7.025, 14.050, 28.050. For $6, KX6BU will issue a QSL, certificate, and a 64-page book on the battles of Kwajalein and Roi-Namur. Three dollars will bring the QSL and certificate. Send all requests to KX6BU, Box 444, APO San Francisco 96555-0008.

CLARK GABLE BIRTHPLACE
FEB 1

The Harrison ARC will operate special-event station N8TF on February 1 from the birthplace of Clark Gable. SSB operation will be on approximately 3.875 and 7.230 MHz from 1400-2200 UTC. For a special QSL, send QSL and SASE to KC8XS, PO Box 362, Cadiz OH 43907.

WEATHERSAT

Number 28 on your Feedback card

Dr. Ralph E. Taggart WB8DQT
602 S. Jefferson
Mason MI 48854

RADIO LAN

This month I had planned to talk about approaches to the design of timebases for the satellite station. With the first three columns safely on disk and off to *73*, I headed west for a month of geological fieldwork, confidently assuming I would start column #4 (this one) on my return. Instead, what awaited me on my return was a very disturbing letter from Richard Barth W3HWN of the Office of Radio Frequency Management at NOAA. The problem posed in this letter was serious enough to follow up with a phone call, and that in turn has led to the redirection of this month's column. The discussion of timebases can easily wait another month, while the subject this time around will not!

The problem relates to the possibility of a new radio service that has the potential to cause severe interference problems in the 1700–1710-MHz satellite bandl Prior to the description of the problem, let's begin with some background as to why this particular piece of rf "real estate" need concern us.

Anyone interested in weather satellites is familiar with the TIROS/NOAA polar-orbit satellites, if only because the APT (automatic picture transmission) images transmitted on VHF by these spacecraft are among the easiest to receive and hence tend to be the first target of aspiring weather satellite enthusiasts. In the "old days," which in the case of weather satellites means the late 60s through early 70s, the APT images transmitted by polar orbiters were the *only* images transmitted by operational spacecraft. With the arrival of the first ITOS satellites, which served as the early operational NOAA spacecraft through the middle 70s, scanning radiometers replaced vidicon cameras as the primary imaging instruments.

The ITOS spacecraft had two radiometer systems, one operating at relatively low resolution to provide direct broadcast APT and another, the very high resolution radiometer (VHRR), providing high-resolution, multi-spectral imagery for reception by government ground stations. With the advent of the TIROS-N spacecraft, the basic bus for all current spacecraft in the NOAA series, the two classes of radiometer have been replaced by a single model—the advanced very high resolution radiometer (AVHRR)—capable of producing multi-spectral imagery of extremely high resolution, and it is the high-resolution picture-transmission (HRPT) signal that is the primary imaging service from these spacecraft.

The HRPT signal is digital in nature and carries information from two visible and several IR spectral bands, transmitted at extremely high bit rates using phase modulation in the 1700–1710-MHz band. The lower-resolution APT signal is derived by digitally sampling the HRPT data stream, permitting correction for panoramic distortion in the APT signal output. The visible APT channel represents data from one of the two HRPT visible spectral bands, while the IR APT output is derived from one of the many IR channels of the HRPT data stream. Since the APT image data represents only a fraction of the original HRPT data, the APT images have far lower resolution than the original HRPT image, but this is the price to be paid to have the simplicity of AM modulation of a simple subcarrier and the use of simple, relatively narrow bandwidth FM receivers!

The technical problems involved in setting up an HRPT station are immense, and it was never envisioned that any more than a few government ground stations would be used. The problems include the following:

1) Antennas. The HRPT signal is low-powered (about 5 Watts) but operates at a wide bandwidth, resulting in the need for high-gain antennas and low-noise preamps. The high-gain antennas (dish, multiple-helix arrays, or whatever) have a correspondingly narrow beamwidth, and thus the antenna must be tracked with extreme accuracy during a polar-orbit pass.

2) Receivers. The HRPT receiver, exclusive of the low-noise S-band front end already noted, must have a wide bandwidth (relative to APT) and a digital detector for data demodulation. Gain margins are quite small so the bandwidth must closely match that of the signal, and this leads to problems with Doppler shift. Doppler shift is proportional to the operating frequency so, while it is only a few kHz at VHF, it is several tens of kHz at S-band! Ideally, to minimize noise effects, the receiver must match the bandwidth of the transmitted signal and incorporate afc to "track" the signal frequency during a pass.

3) Display. This is an area that presents many challenges since the multi-spectral images have inherently greater resolution than most common display devices. Problems include developing software to: lock onto the HRPT data stream, decode the data, store as much of it as possible, and sample portions of the data set with an intensity proportional to the resolution capabilities of the display system. Computer power and mass data storage are the keys.

Technology does not stand still. The steady fall in price of commercial HRPT systems coincident with an increase in amateur capabilities has led us to the point where there are more than 120 known HRPT stations, a number of which have been constructed by "amateurs." The amazing leaps in rf and microcomputer technology, including the arrival of GaAsFET preamps and the power inherent in AT-level microcomputers, mean that HRPT capability will continue to become more affordable and hence more within the reach of the "typical" amateur. It was only about 10 years ago that WEFAX capability on S-band was considered out of reach of amateurs. Today it is almost as easy to set up a WEFAX station as it is to build an APT system. It is reasonable to expect HRPT capability to follow a similar track. The prize is worth the effort, as examination of this month's picture of the month will indicate!

All of this rambling constitutes the "good news"—now for the bad. The same rf and computer technology that is bringing HRPT closer to the "masses" has other implications as well. If you are at all familiar with computers, you have probably run into the acronym LAN, which stands for local area network. A LAN involves interconnecting a number of microcomputers to each other and often to a central mini or mainframe unit. Such systems are extremely powerful since machines in the system can share files, programs, and computing power, and LANs are definitely "in" in business and scientific enterprises.

If a LAN is to be effective, the micros in the system must exchange data at very high speed and this leads to the only drawback of a LAN system—the need to interconnect all components of the system with wide-bandwidth coaxial cable or fiber-optic links. The need for this wide-bandwidth physical connection makes it difficult to re-site individual units, so Motorola has come up with an interesting new approach known as "Radio LAN." Instead of a physical link between LAN components, Radio LAN proposes a wideband rf link, making it far easier to move components of the system around a complex as changing needs dictate.

While this is marvelous in concept, it is the implementation that has the potential to be disastrous. In its Radio LAN proposal to the FCC, Motorola requested the use of the 1700–1710-MHz band for this system. Citing very few HRPT stations, they felt that such a system could be implemented by sim-

Date	1 January 1987		
Spacecraft	NOAA-6	NOAA-9	NOAA-10
Orbit Number	39061	10574	1498
Eq. Crossing Time (UTC)	0133.43	0032.85	0012.79
Longitude			
Asc. Node (Deg. W.)	107.19	144.08	70.51
Nodal Period (Min.)	101.1277	102.0851	101.2979
Frequency (MHz)	137.50	137.62	137.50

These orbital parameters are projected two months in advance due to deadline considerations. Accumulated errors due to uncompensated orbital decay and other anomalies result in expectation of errors up to two minutes and possibly as many degrees in terms of the crossing data and possible small changes in the indicated period. Users requiring precision tracking data should rely on more current sources.

Table 1. TIROS/NOAA orbital predict data.

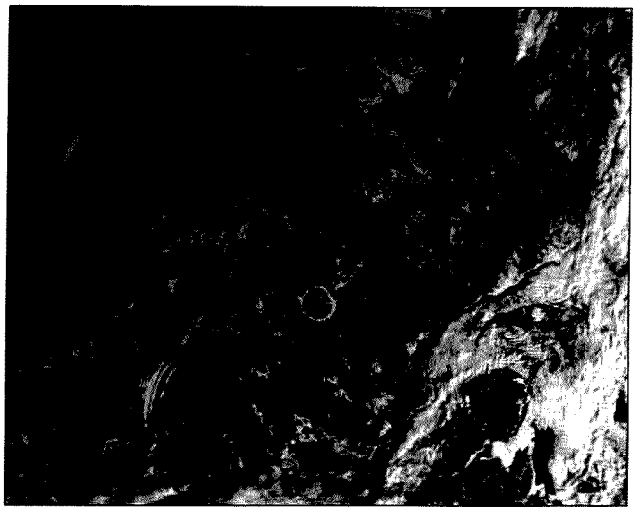
ply avoiding existing HRPT station locations.

The problem, of course, is far more complex. First we actually have far more HRPT stations than previously suspected, and many of these will be difficult to locate as there has been no need to register the existence of such installations. Although the pro-"Radio LAN" forces see the number of such stations as relatively stable, the experience with WEFAX indicates that the numbers could rise dramatically as technological advances continue and the cost of installation falls. Imagine your local 1700-MHz noise floor in a few years if you set up an HRPT system, only to discover that a local business, university, or other agency is passing around data on an rf LAN! Ditto for an existing installation whose location is unknown, causing the installation of a local 1700-MHz noise generator.

The impact on WEFAX operations (1691 MHz) is uncertain; it all depends on the frequency stability of the LAN rf sources and their proximity. You may very well need rf pre-filters to avoid desensing, and these will degrade your system noise floor. Each and every one of the hundreds of existing WEFAX stations also represents the nucleus of a future HRPT installation since antennas and rf capability are already in place!

If this were not bad enough, the FCC, in replying to the Radio LAN proposal, responded with a notice of proposed rule making (NPRM) that was far broader than the initial LAN proposal, leading some to suggest that it was now "open season" on the 1700-MHz band! By raising the possibility of remote rf digital links, the industry is buzzing with ideas on what could be accomplished if only the erp limits could be raised by a "mere" 10 dB or so!

The inherent mobility of Radio LAN units presents very real difficulties even if we consider only existing HRPT installations. Their very existence may very well propose a fatal inhibition on the development of new installations. Expansion of the 1700-MHz rf data-link concept represents the potential of insupportable rf pollution of this particular window into space. An rf link between space and ground is an absolute necessity, but this important link may well be drowned out by thousands of computer and other digital rf links that are simply a convenience compared with the hard-wired alternative.



An old VHRR shot from the earlier NOAA series. This particular picture has the Gulf of St. Lawrence in the lower right, complete with ice cover and a bit of Anticosti Island. All the interior lakes in Quebec and the northern Gaspe Peninsula are snow and ice covered. The circular feature in interior Quebec is Lake Manicouagan. The HRPT images are even better, with higher resolution and obtained at a lower altitude.

Our alternatives are remarkably limited at present. The comment period on the FCC NPRM has passed and the fate of the proposal is unknown. If the Federal wheels grind slowly enough, we may gain some leverage in decision making by means of the second alternative—the registration of HRPT stations. Such a registration was the subject of Mr. Barth's letter that generated this particular column. In effect, he was attempting to locate operational HRPT stations and those in the "serious planning" stage. NOAA is willing to register such stations at no charge and with no obligation, provided they can be located. Registration of your installation requires that you furnish the following information:

1) Latitude and longitude of the station to the nearest minute.

2) The name and address of the person or organization operating the station.

3) The name, address, and phone number of a contact person in case further information is necessary.

This information should be forwarded to: Office of Radio Frequency Management, Room 6106, Main Commerce Building, Washington DC 20230. If you have questions or need more information, contact Mr. Richard Barth at (202)-377-0635.

Registration of your station can have two possible effects. The first is direct. Should Radio LAN or other such systems be approved, registration will inhibit siting of such a system close enough to your installation to cause harmful interference. In essence, registration will protect your *present* station location(s). The second effect of registration may be even more significant. If the number of registrants rises high enough to present a significant administrative burden, the FCC may opt to look at alternatives to the 1700–1710-MHz band and that would bode well for the future!

There is little question about registering an operating HRPT station—you had better do it! But what constitutes enough "serious planning" to register a system that is not yet operational? This is a judgment call for each individual, but let me suggest a few operational guidelines for your consideration. *Any* existing or upcoming WEFAX installation can receive in the 1700–1710-MHz range in question by simply tuning the i-f to the 146.5 to 156.5 MHz range, assuming the standard 137.5-MHz i-f for 1691-MHz WEFAX. I cannot assume how you might wish to use or experiment with such a signal, but if you are equipped and wish to do so, your reception capability deserves protection since the meteorological satellite link is primary in this band. Give it some thought!

New TIROS in Orbit

As this is being written NASA has broken its hard-luck streak and succeeded in launching a new TIROS spacecraft from Vandenburg. The spacecraft successfully reached orbit and preliminary indications look very good. Checkout of HRPT and APT Imaging systems will begin shortly. Assuming all goes well, this spacecraft will become NOAA-10 and will serve as the replacement for NOAA-6, becoming the operational "morning spacecraft" on 137.50 MHz. Given the nature of the deadlines for column text and predict data, you will already have seen this change reflected in the December predict listings, in which NOAA-10 replaced NOAA-6.

Satellite Bulletin Board

Those of you with computers, modems, and communications software should look into a useful and well-run bulletin board service (BBS) provided by Jeff Wallach N5ITU. This board (214-340-5850) operates 24 hours a day at 300/1200 baud with 8 data bits, no parity, and 1 stop bit. This is a free, open-access service supported by Jeff and a number of other talented folks devoted to providing current information on both manned and unmanned spacecraft. Up-to-the-minute spacecraft status bulletins are provided, as well as bulletins containing the Keplerian elements for a wide variety of satellites, including NOAA and METEOR/COSMOS spacecraft.

The system also provides a comprehensive electronic message system. I check into it about twice each week to pick up and leave messages related to weather satellites. Jeff has been kind enough to offer the use of his system for message traffic between me and my readers, and those of you with message traffic may want to use this option. Turnaround time on messages should be dramatically shorter than using the mail, so if you have ideas or input for the column or reasonably short questions, leaving me a message on the system would be a very effective way to get my attention. I erase all messages to me once they have been successfully downloaded, so if your message number disappears from the current message directory, you will know I got it and you can start looking for a reply.

As a service to all, I am posting an open message at the beginning of each month entitled APT PREDICT. This message will con-

tain reference crossing data for the month in the same format used for this column. While the column predicts must be projected two months in advance, the monthly data in the open message will be absolutely current and thus will avoid the inevitable inaccuracies that are unavoidable when you make long-term predictions for spacecraft in relatively low orbits.

Color Computer 3

The big event for me this month was the fact that I finally got my hands on the long-awaited CoCo 3! This beauty comes stock with 128K of RAM (compared to 64K in the CoCo 2) for $219, and a RAM upgrade board is available for $150 that will take it up to 512K bytes!

The new CoCo runs my Version 3 software for the *WSH* scan converter with no problems, providing full-frame automatic WEFAX, NOAA APT, and both 240-lpm and 120-lpm display in a 256 x 256 format with 16 grayscale shades. Version 4 is in the works now and will probably be ready by the time this appears.

When the program pack is plugged into a CoCo 1, 2, or 3 with 128K, all of the present functions will be available. The real fun will occur if the program detects the 512K RAM in a CoCo 3! In that case, the system will load an image to the CoCo memory with 1,024 pixels/line with 768 lines! Although the system will still default to the transfer of a full-frame image to the 256 x 256 display, if you choose to freeze the image, you will have a whole new set of high-resolution display options based on the recovery of portions of the highly detailed image in memory.

Six medium-resolution quadrants will be available (each representing approximately 1/3 of the total image area at about 1/2 resolution) or a total of 12 high-resolution quadrants can be displayed. This latter option includes every line with horizontal resolution that pushes the theoretical limits imposed by the 2,400-Hz video subcarrier.

Since the original very high resolution image is loaded directly to memory as the picture is received, you can explore the entire image at any resolution you desire! The pictures are truly mind-blowing in detail, either from WEFAX or the polar orbiters, and all of it requires just $369 in computer hardware and the less-than-$100 *WSH* display! I'll keep you posted.

Picture of the Month

Since this column was unexpectedly diverted to the subject of HRPT, this month's picture is included as a "teaser" to indicate the mind-blowing resolution attainable with an HRPT installation. The problem was that I had given away my last HRPT sample. Given the deadlines, I opted for an old VHRR shot from the earlier NOAA series.

This particular picture has the Gulf of St. Lawrence in the lower right, complete with ice cover and a bit of Anticosti Island. All the interior lakes in Quebec and the northern Gaspe Peninsula are snow and ice covered. The circular feature in interior Quebec is Lake Manicouagan—possibly an ancient meteoric impact feature.

To give a sense of scale, this feature is approximately 45 miles across. This segment represents only a small part of the original image. The HRPT images are even better, with higher resolution and obtained at a lower altitude.

Note

References to *WSH* refer to the Third Edition of the *Weather Satellite Handbook*, available directly from the author at the address at the beginning of this column, for $12.50 plus $1 shipping and handling in the U.S. and $2 elsewhere.■

FUN!

Number 16 on your Feedback card

John Edwards KI2U
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THE FUNKER FOLLIES

Have you ever sat down and thought about the "worsts" in your life?

Perhaps it was the time you upchucked over Mary Sue Pennypacker at the high school prom (a first brush with rye whiskey can do that to a guy). Or maybe it was the time you opened that envelope from the FCC containing your virgin Novice call. Remember how you felt when you first realized that you would be sending CQs with KAØOOO at 5 wpm until you could upgrade? Or perhaps it was the time you were installing your tribander and you dropped the wrench into the windshield of your new Corvette? Ah, memories.

For me, the ultimate, worst, all-time, crummy, most rotten experience was my first job. It was with a company in the ham radio business, which should tell you something right off the bat.

Now, for most of you, getting a job with a ham radio company probably sounds like a dream come true. All you do every day is sit down at your desk and work DX on 20, right? Sure. And magazine writers live in Park Avenue penthouses. (Some writers may actually live in such abodes, but certainly not those who toil for ham radio magazines.)

This job, which was with a company that made hand-held microphones, sucked coax. Yes, it sounded good when, in response to my resume, the company president called to describe the position to me. "You'll be our advertising manager," he said. But little did I know that being advertising manager of a company with approximately $100,000 in gross yearly sales wasn't exactly the same as being head of promotion for General Motors.

I'll admit my qualifications for the job weren't exactly outstanding, either. (I was a recent college grad with absolutely no work experience.) But at $8,000 per year, my boss was getting a steal (even in 1979, I was undoubtedly the lowest paid advertising manager in the United States). I mean, how many companies can ever say they had Mr. Fun! in charge of their advertising program?

The first problem was my boss, a Mr. Ronald T. Funker Jr. Now, Funker Mikes was a funny outfit because Funker Jr., president of the firm, was and wasn't my boss. The real head of the outfit, if you took the time to scratch beneath the letterhead, was Ronald T. Funker Sr.—Funker the First or Funker the Futz, as his employees called him.

Funker the First founded the firm in the 50s. Funker Mikes ran ads in *QST* that showed a little man lifting a big microphone on his knee. The ads made no sense, but you may remember them and they made the company a lot of money.

Anyway, through an intra-family squabble that was a Grade Z version of television's "Dynasty," Funker Jr. had wrested control of the mighty mike conglomerate away from Funker the First. As a result, the first Funker had a big ceremonial office in which he sat (in a funk) doing little except sharpening his vengeance toward Funker Jr.

Funker Sr. would show his animosity toward Funker Jr. in the most humorous and witty ways, like calling him "stupid." Funker Jr., on the other hand, was even more subtle. He would place a rancid onion inside the ceremonial microphone on Sr.'s desk or loosen the bolts on his father's chair so he would strike his head against the wall whenever he sat down. There wasn't much of what you would call love between the Funkers.

As I mentioned, Funker Jr. was the Funker who hired me. Therefore, ipso facto, Funker the First hated my guts. I initially sensed this when the old man refused to shake my hand. But Funker Jr. told me not to worry, calling his father a "crazy old coot," and said I should get to work.

Sage advice. The only problem was that there was no work. The Great CB Boom was dying out and the microphone market was in a sort of depression (in the same sense that a Cray supercomputer is sort of a micro). In short, Funker Mikes wasn't selling many of its namesakes. (Microphones, that is, not Funkers. Although selling some of the Funker clan might not have been a bad idea, either.)

At any rate, Funker Mikes sold only to the ham community. The elder Funker refused to market any of his products to military or commercial users. I don't think he had any reason for this not-so-shrewd marketing move; it was just that it probably never occurred to him that anyone but hams used hand-held microphones. Go figure it.

Funker Jr. permitted me to run ads in only three ham publications. I won't name the periodicals, but you can probably guess most of the titles, since there were only about four or five ham titles on the market at that time. (Hint:

Two of the magazines had titles with seemingly random letters of the alphabet and the other used a number for its title.)

Now, you might think this sounds like pretty easy work. I mean, running the same ads in three magazines doesn't sound like the toughest full-time job on the face of the earth. And it wasn't. As it turned out, things were extremely easy. Too easy, in fact. Too stupefyingly boring easy. Day after day, I would trudge to my desk, open a notebook, and try to look busy.

Have you ever tried to look busy when you had absolutely no work to do? It's not as easy as it sounds. After all, there are only so many pencils to sharpen, so many drawers to arrange, and so many paper airplanes to throw.

After a few weeks, I began to long for work—real work. Sitting at my desk, eyes blankly fixed on a copy of a ham magazine, I would dream of meaningful labor. I longed to write reports, to attend business meetings, to get yelled at by a boss. After a while, things got even more desperate. I began to think of myself doing work I never would have contemplated in the past. I wanted to be a window washer, or a fellow who painted suspension bridges, or the guy who replaces the light bulbs on top of broadcast towers. I even wanted to drive a New York City taxi! Arrrgh!

Meanwhile, Funker Mikes was failing, and there was nothing I could do to stop the company's inexorable slide into oblivion. Funker was yelling at Funker, and I was responsible for placing ads in three magazines. I had to regularly pinch myself to be sure I wasn't in some sort of Ham Hell. (Please, dear God, I'll never forge another DX QSL.)

Then, slowly, like a landscape appearing before my eyes, the truth revealed itself to me. I, John Edwards, was a pawn in a chess game. And not even a fancy chess game, with Civil War characters sold by the Franklin Mint. I was the pawn in a chess game with plastic pieces from a five-and-dime store.

The truth, in all of its horrifying glory, was that Funker Jr. was using me to get back at Funker Sr. It didn't make any difference whether or not my job ever made a damn cent for the company. I was there out of pure and simple spite. Funker Sr. didn't have the nerve, will, or power to fire me, and Funker Jr. was going to keep me in my stupid job, paying me 8,000 crummy bucks a year, until either the world or Funker Mikes came to an end. I was a capitalist tool!

That evening, I quickly drove home to my one-bedroom apartment. After gulping down a quick snack, I threw all of my meager possessions into a suitcase and drove to my mother's home about 300 miles away for R&R. Funker Jr. never called me, and my best memory of the whole experience was seeing the Funker Mikes sign slowly growing smaller and dimmer in my car's rear-view mirror.■

ATV

Number 14 on your Feedback card

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CAMERAS AND VCRs

My first three columns took you step by step through the basics of amateur TV. This month, let's talk about a subject that this column hasn't touched upon much: cameras and VCRs. One of the big problems in getting on ATV is the expense of a good camera. To get a good, small, lightweight, full-color camera a few years ago, you had to take out a bank loan to finance it.

But have you checked out the prices today? VCR-type color cameras have dropped significantly in retail price since 1985. The market for VCR home video equipment and movie rentals skyrocketed during this period and is still riding high today. A larger market means more fierce competition and lower prices for the consumer.

Today, if you shop around, you can buy a no-frills home VCR recorder for less than $250. Player-only units are even less. A good color camera with a zoom lens and auto everything averages around $400–$600. Oh sure, you can spend a lot more—and most people might want to with all the neat options now available, such as color keyboard graphic generators, timers, clocks, and the like—but you don't have to just to have something nice for ATV.

Keep in mind that such a purchase will most likely be used for recording the growth years of the family just as old 8mm movies used to do. (This is a good approach to use on the XYL to justify stretching the budget.) Many of you already have such equipment, and this expense has already been incurred. Great!

VCR-type cameras and recorders can be interfaced into fast- and slow-scan TV systems very easily. With such gear, you are halfway to getting active on the mode.

What if this type of purchase, though, is a bit too heavy for the beginning ATVer? At hamfests there are tables full of surplus industrial-type closed-circuit security black-and-white cameras for $30–$90? They will work just fine. You can go to any major hamfest these days and see good deals on used camera and VCR equipment. Some come with lenses, some without.

Cameras are scary to buy sight unseen. My best method is to look closely at the unit. Is it scratched or dented, or does it have dangling broken parts? Is the lens cracked? Does the viewfinder TV screen work? Talk to the seller and get him to say whether or not this camera really works. (Flea marketeers don't lie, do they?) Ask him if there are any burn marks or spots on the camera tube itself. Then watch his eyes on the big question: Let's go inside, hook this camera up to a monitor and 110 V ac, and give it a try, OK? If he starts doing the backstroke or says he is too busy working at his table, beware.

If you do get stuck, most replacement camera tubes are not all that expensive. A good source of used and new tubes (and good working cameras, for that matter) is Mel Shadbolt W0KYQ at ATV Research, 1305 Broadway, Dakota City NE 68731. Mel actually began the former *A5* Magazine with the help of Wayne Green and *73* many years ago. He is a respected ham and will help you with whatever you need.

An old discarded black-and-white camera picked up for $10 in non-working condition can sometimes be revitalized for little cost. The classified advertising section in *The SPEC-COM Journal* often has such bargains, too. Sometimes, big hefty studio-type cameras that work are sold or given away. Most people want small, lightweight units. If you have the room for a CBS-3, which weighs more than your mother-in-law, go for it. Won't the neighbors be impressed?

Interfacing Video Equipment

The camera and VCR plug directly into fast- and slow-scan TV converters. You might encounter some uncommon connector problems, but they can be easily overcome. Most slow-scan converters use BNCs for camera inputs. Radio Shack has all kinds of adapters to get you down to a BNC male. Fast-scan TV transceivers use either SO-239s, RCAs, or BNCs. Video cables should be 75 Ohms.

Length is not critical for the ham shack if you want to mount your camera up close to the ceiling in a nearby corner and run a length of cable over to your rig. Some will get a tripod to put it on, while others will just rest it on a pile of old *73*s. Be sure and hide the wires so that the kids and XYL don't trip over them, making the rest of us watch pictures resembling a helicopter out of control.

There are video level brightness and contrast settings on the FSTV/SSTV rigs, so don't worry if you don't see anything like that on the camera itself.

VCRs are really nifty once interfaced on ATV. They can be fed an ATV signal one of two ways: *direct*—ATV downconverter CH.3 or sampled video outputs right into the VCR or *indirect*—by simply pointing the camera on the TV set. The direct method seems to work best for stronger signals and presents a full-screen image on the replay. On weaker or sync-unstable signals, filming right off "the tube" works best, especially on DXing. To send someone your best pictures of your shack and then to see them coming back on instant replay is something that's not done in any other amateur mode.

I have nearly six years' worth of videotaped cassettes of ATV QSOs and special events. It is a

lot of fun during a cold winter night to replay these tapes to others and "see" how far we all have come in just a few years.

In every group, a member passes away now and then. It is heartwarming to replay videotaped material of that ATV friend now gone. Later on, the families will want a copy, too. I edit most of my tapes and condense them into shorter programs. Most of them have dates and titles. The coming of the VCR has been a big boost to the operating capabilities of the ATV operator in the 80s.

Location

Where is the best place to put your ATV camera? It depends on what you want to show. Some ATV operators like to be flexible with their camera and have it mounted so that they can quickly remove it and hand-hold it on the subject material. It is fun to be able to walk around with your camera in the shack and show different pieces of gear or that latest project that you are building. Others like to fix their camera on a wall mount or tripod so it points down at the operating position. Some like it facing them head on, while others like a backside approach, catching the majority of their equipment in the picture as well. It just depends on your room, the capabilities of your camera, and what you like to show.

Slow-scanners need to have the camera close by for focusing on close-up picture photography. Did you know that color SSTV can be sent from black-and-white cameras? Kodak gelatin red-green-blue filters can be placed in front of the camera lens and "snatched" into three memories for a bright and beautiful full-color picture. That method is fading slowly with the advent of more sophisticated color SSTV equipment, such as the ROBOT 400C, 450C, and 1200C units, which accept color cameras for inputs.

Wide-angle lenses are a near must for the fast-scanner to get the most in the picture. The walls of every ATV shack are lined with CQ-ATV and callsign posters for the camera to focus in on.

Using your camera on ATV is certainly a lot of fun. One night, we all transmitted our shack pictures one by one "upside down" to an individual who was just getting started. The terrible, sneaky plan backfired when he came back on the air a little while later proclaiming that he had simply turned his TV set upside down to compensate for our mischief. . . shucks!

Photo A. Bill Bryant K9KKL of Springfield, Illinois, sends his FSTV picture 110 miles to WB0ZJP in St. Louis, Missouri (100 Watts).

Many ATVers have more than one camera. Some have them spotted all over the place. Controlling is done by manual video switchers or more elaborate automatic "scanning" switchers found in surplus CCTV buy-outs. A few brave souls mount a camera on the roof or on their tower. If you go first-class, you'll put it in a weatherproof box and add a heater, a rotor motor that pans and tilts, and, of course, a windshield wiper in case it rains (and they think I am kidding, Warren W5DFU).

WOWT-TV in Omaha, Nebraska, has an 800-foot tower with TOWERCAM on it, controlled by WB0CMC and the local Omaha ATV repeater crew. Imagine the thrill of tracking bad weather as it passes through the area and seeing the night lights of the city or that blonde beauty sunbathing 17 miles away. Shame on you, John.

Finally, you can feed anything that is video into ATV transmitters—cameras, VCRs, computers, other TV sets, games, and so on. That really opens the door for a wide range of available ATV entertainment.

ATV Repeaters and Remote Transmitters

I promised a few words about ATV repeaters. A few points I touched on in earlier columns should be re-mentioned. It is not uncommon to hear a "new" ATV group (active fewer than two years) start making plans for an ATV repeater right away. That, in my opinion, can be a fatal mistake. Why? Because UHF FSTVers need at least a couple years of self-development at their own stations to get to the point where they have their equipment, cables, antennas, preamps, and the like operating at near full capacity on simplex frequencies.

So what if you live 30 or 40 miles from each other? Making those ATV pictures appear on the other guy's screen is most of the fun. ATV repeaters (like any type of relay device) can discourage self-improvement activities. It is only human nature to become lazy. Simply put, if you get 12 of your best friends to get on UHF FSTV with you and your group puts up an ATV repeater, it is likely that 11 of them won't get out more than 10 miles in the next 20 years. I have seen it happen in so many areas.

Do it on simplex for a while, and once you feel that your group has experienced its share of growing pains; has operated multi-element beam arrays, mast-mounted preamps, and hardline or at least 9913 coaxial cable; and has worked a lot of DX out to several hundred miles (if that is possible in your area), then and only then should you consider an ATV repeater system. Irresponsibly thrown-up repeaters might grab quite a bit of interest in the beginning, but once people start getting hit with simple UHF or video-related problems, Interested users will drop like flies.

Polarization May Be Hazardous to Your Health

Repeaters must be placed in the right antenna polarization mode as well, or severe damage to activity levels can occur. In Indianapolis, Indiana; Columbia, South Carolina; Minneapolis and St. Paul, Minnesota; and parts of Kentucky, New York, and Texas, well-intentioned people decided to change from the antenna polarization used for years by ATVers to vertically polarized ground-plane antennas on their repeaters.

Immediately, most people changed their antenna polarization to work the repeater. (There is a 20-dB loss factor on cross-polarized signals.) Many promised to have switchable array systems, but never went back to the former mode. Some refused to make the change. Others dropped out of ATV because they did not have the time, ability, or money to make the switch. Those stations out 50–100 miles or more were left in the cold and were forced to change or search elsewhere for contacts.

Careful consideration must be made in this decision. There are now a number of published antenna designs for horizontally polarized omnidirectional antennas *with gain*, and they work well. K4NHN's Rib-Cage Slot antenna, for example, shows a 7-dB gain over a half dipole.

My group's multi-phased KLM 6-element beam array in Davenport, Iowa (N9CAI/R), has been up and working for more than two years now and covers our regional area quite well, both on receive and transmit, for an actual repeater working "circle radius" of more than 100 miles in all directions. All this was done with the ATV repeater and remote transmitter horizontally polarized, and *no one* had to change one element on any antenna.

The majority of the country is horizontally polarized on FSTV. If you live in or near an area that is vertically polarized, then by all means go vertical. The point I am trying to make to you, the newcomer, is to look around, out to several hundred miles, and then determine the antenna polarization that is right for you.

See you next month, and don't forget to send in your Reader Service and Feedback cards. Keep the mail coming and "see you" on the tube.■

NK6K > PACKET

Number 22 on your Feedback card

Harold Price NK6K
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Redondo Beach CA 90278

Did you answer the December, 1986, packet poll? If not, you probably still have plenty of time to do so, as I'll most likely procrastinate on tallying up the totals, just as I procrastinated on this column. I have to be on a plane to Boston in nine hours for a trip that will end up at the AMSAT annual meeting in Dallas, and this column has to be in before I go. The AMSAT meeting, with its discussions on the new Phase 4 satellite project will give me enough to talk about for the February column, and I can start on it as soon as I get back, right? Don't be silly.

Good News, Bad News

First, the good news. The FCC has made the waiver to 85-105, which allowed unattended transmission of third-party traffic above 50 MHz, into a permanent part of Part 97—section 97.80(b). The waiver was discussed in my November, 1986, column. Now for the bad news. It still mentions AX.25 by name and makes it the only protocol that can be run unattended to transmit third-party traffic. An excerpt of the FCC ruling follows. It was originated by Bob KY3R and relayed via packet:

"(b) No amateur station may be operated under automatic control while transmitting third-party traffic, except an amateur station retransmitting digital communications on frequencies 50 MHz and above. Such stations must be using the American Radio Relay League, Inc. AX.25 Amateur Packet-Radio Link-Layer protocol, version 2.0, October, 1984 (or compatible). The retransmitted messages must originate at an amateur station which is under local or remote control."

This is, of course, mostly good, as it makes expressly legal the major operating practices of a large number of the 30,000 TNCs in North America. It sets a dangerous precedent in two ways, however.

First, it specifies AX.25, and a specific version at that. It would seem to freeze packet radio, at least for unattended packet BBS stations, at the 1984 level. If any new protocols are introduced, the developers must include in their time tables a magical mystery tour through the federal labyrinth for an STA or new rule-making action. This runs counter to the original wish to deregulate unattended operation enough so as not to impede packet development. I'm not blaming the FCC for this turn of events, mind you. I'm blaming the ARRL, specifically the Ad Hoc Digital Communications Committee, which is to say I'm blaming me.

If you're a regular reader here, you know that I'm a member of the ARRL digital committee, a group commissioned to advise the League on packet matters. When the specter of having AX.25 mentioned by name was first raised, I and most other committee members said that while we would rather not see AX.25 specifically mentioned in the waiver, it was better than nothing as long as the waiver was temporary and AX.25 did not end up in Part 97. As I recall, there was near universal agreement that mentioning a specific protocol in Part 97 would be a bad thing. Even though we should have seen it coming and should have done something about it, there is no one to blame but ourselves for having AX.25 in Part 97 as the ONLY protocol sanctioned for unattended operation. Rest assured that I'll bring the topic up at the next digital committee meeting. If you have thoughts on the subject, drop me a line.

The second bad thing is that this is, I'm pretty sure, the first time that the ARRL is mentioned by name in the body of Part 97. Even 97.112(b), which permits the W1AW operators to be paid, doesn't mention the ARRL by name. As I said in my first column for *73*, I think the ARRL is a mostly good thing. I'm a member and I work on one of its committees, but seeing it mentioned in Part 97 gives me an uneasy feeling. It's just as if the FCC said, "You must know the Morse code as defined on the Wayne Green code tapes." It gives me the creeps, as if someone walked on my grave.

In any case, the recent 85-105 ruling is a good thing for the near term. The bad part will affect only a small number of people in the next few months, but it could hurt all of us later as packet continues to evolve and perhaps to adopt new protocols. After all, the 85 in "85-105" means 1985. It took a long time to get this far.

High-Speed Modems

I received a message via packet regarding something I forgot to mention in the October column on higher speeds. Mark N2MH writes:

"...to get the really fast speeds 56K (64K if you believe in being compatible with ISDN) and 1.544 Mbps, full-duplex links for the duration of the connection will be required. This current ethernet-style packet will just fall apart at those speeds. You will probably find that even at current speeds, full-duplex links will dramatically increase throughput. All of your timing parameters for turnaround can be set really short once there is no turnaround.

"In the quest for faster radios, one should not overlook the use of rf modems. These are devices that are designed for use on broadband LANs (CATV technology). C-COR manufactures a device that goes from 30 MHz up to 216 MHz and can run 9600 on 25-kHz channel spacings."

Mark's comment on ethernet is a reference to our current simplex network, where the TNC turns your transmitter on, sends a packet, turns your transmitter off, listens on the same frequency for a packet, etc. If you run full duplex (transmitting and receiving at the same time on different frequencies), there is no turnaround time, and the black-hole effect does not exist. Thanks, Mark, for your message.

Although it's hard to be a rumor monger with a two-month publishing delay time, a rumor that will hopefully be fact by the time you read this is that a major TNC manufacturer (they have a three-letter name, but Vanna couldn't turn them over; you'd have to buy them) will soon be shipping a high-speed (9600 bps) rf modem. An rf modem is a box with a data port on one side and an antenna connector on the other. Connect a TNC (via its modem disconnect) to the data port and you're ready to go! High speed, fast turnaround. Drool. It will take an easy-to-install box like this to get some high-speed links up, I'm afraid. A good design for a separate modem, the one from K9NG, has been out for a while, but the amount of effort required to build it, modify a radio, get it running, and then talk someone else into doing it and get both of you together on the same frequency at the same time seems to be just the other side of that magic line that separates the "likely to occur" from the "fat chance." I'll try to get some hard facts on the new gear in the next month or two, and I'll let you know if it's as good as it sounds.

Packet DXCC

Table 1 is the most recent list of countries with known packet activity. Forward any new entries to NK6K @ NK6K. This list was compiled from information from WØRLI, WD4BIW, W9ZRX, N1DL, DU1POL, KB7G, K2AAA, AD8I, HK3BCA, W3IWI, WD9DHI, and WA6OWM, as of 11/5/86. Sixty-one countries are listed.

3D6	DU		HC	KH6	OZ	VK
5H3	EA		HH	KL7	PA	VP2M
5V	G	F	HI	KP4	PJ	W
9K2	GI		HK	LA	PY	XE
9M	GJ		HP	LU	SM	YB
9V	GM		HT	LX	ST	YJ
CE	GU		I	OE	TG	YV
CN8	GW		JA	OH	TI	ZF
CT1	HA		KG4	ON	T3Ø	ZL
DL	HB		KHØ	OX	VE	ZS

Table 1. Sixty-one countries with known packet activity.

Restricted BBSs—14.109 MHz

Some folks have been griping about the action taken by a group of HF packet BBS operators recently to restrict access to their stations. The 109 gang has a list of a small number of stations, and they'll only allow connects from the other people on that list. Anyone else is automatically rejected. Even worse, these guys hog an HF channel all day, every day. Time for tar and feathers, right? How about if I told you that these guys have moved more traffic for the general amateur community in the last two months than has

been moved on HF packet since 1983?

A restricted BBS is one that allows only stations listed as BBSs to connect. Regular users are immediately disconnected if they try to connect. Restricted HF BBSs are a delicate subject, but in the great *73* tradition of a bull in a china shop, delicacy is no deterrent. To further explain restricted BBSs, let's discuss how the HF forwarding network works.

A forwarding BBS, as defined by the de facto standard introduced by W0RLI, has a list of stations that it forwards to. Each of the forward-to stations has a sublist of calls of people whose mail can be forwarded via that forward-to station. For example, my BBS has a list of stations I forward to, one of them is WB6KAJ-2. Two of the stations whose mail can be forwarded through WB6KAJ are W9ZRX and WB7DCH. Therefore, stored away in a file, is an entry that looks like this:

WB6KAJ-2
W9ZRX
WB7DCH

My BBS then knows that if I have a message for W9ZRX, it should send it to WB6KAJ-2.

My BBS has a parameter called the forward time, specified as a minute from 0 to 59. Once an hour, on the minute specified, if my BBS isn't already connected to someone, it scans the outgoing mail looking at each message to see if the destination call is on any of the forward-to lists, or if there is an @BBS option on the destination that is a forward-to station. If there is such a message, my BBS tries to connect to the forward-to station and pass the message along. It is actually more complex than that, but that's the general idea.

Several things will keep my BBS from successfully passing traffic:

1) If someone is connected to my BBS during the "forward minute."

2) If someone is connected to the forward-to BBS when my BBS tries to connect.

3) If the forward-to station is trying to forward to me or someone else at the same time that I try to connect.

4) If the channel is so busy that my TNC can't connect.

If the traffic is not passed during that attempt, the BBS waits until the next hour's forward minute. As you can see, the more people or BBSs there are on the channel, the less traffic gets passed. If a lot of traffic backs up, the chances increase that the other BBS will be busy when you try to connect or that someone will be passing traffic to you during your forward minute, which will cause more traffic to back up until you have hemispheric gridlock. In this state, a lot of rf is generated, but not many messages get passed.

The worst thing that can happen to a forwarding channel is for a human operator to connect to one of the BBSs. This type of connection tends to be less efficient due to the human think-time involved. That's the performance metric used to describe what you're doing between the time you ask for a list of active messages until you decide which one you want to read. Even worse is if the human asks for the long-style prompt, the help menu.

"The worst thing that can happen to a forwarding channel is for a human operator to connect to one of the BBSs."

Until recently, the status of the HF network, then on 14.107, was one of frequent gridlock. Several HF BBS operators, who determined that their major goal was to forward traffic between widely separated local VHF networks, and not to support direct services for a human on HF, decided to move to 14.109 and set up shop as mail-forwarding nodes, and not as BBSs. If a balance is made between the desire to cover all of North America and the need to keep the number of stations small, a restricted network can move far more traffic than an unrestricted network. Note that "restricted" here does not imply a limit on who can use the network, since anyone may place a message into the network on the VHF side. It only restricts those forwarding to a small group, and it restricts the network activity to forwarding.

Since the start of the 109 network, the forwarding of HF messages has improved dramatically. I'm not one of the 109 crew, but 30K bytes of traffic was moved from a VHF user in the Midwest to my VHF BBS in two hours through the 109 network. This would not have been possible in the gridlock of the previous network.

But TANSTAAFL (there ain't no such thing as a free lunch), so what do we lose?

1) Not everyone can be a forwarding station who wants to be. The same is true for two-meter repeaters—not everyone can have one who wants one. Strictly speaking, in some areas, there are more two-meter repeaters than are required if what you wanted to do was maximize communications. Two-meter analog utilization is a hard thing to measure, but on packet it's painfully obvious. And since there are a large number of people who want to get traffic from city A to city B, we do need to have some concern about efficiency. So, not everyone can be a forwarding station who wants to be, if we are at all concerned about network efficiency.

2) Not every area can have its own forwarding node directly on the main trunk. Some messages may have to be routed further on VHF than would be necessary if every VHF BBS had a local HF link, if efficiency is the goal. Least you think I'm harping too much on efficiency, at the current state of our network and the speeds we're running, there are usually just two levels of efficiency, "barely tolerable" and "the pits." It doesn't take much loss before you slide into the latter category.

3) For maximum efficiency, the frequency should be used only for the forwarding function. It is "lost" to the general community for other purposes.

4) Some users whose only access to the rest of the packet world is via HF are cut off. They can't connect to an HF forwarding node because it just disconnects them. What is needed, then, are a few HF stations, on a frequency other than 14.109, that can bridge to the forwarding network on HF. For example, if two W0RLI HF BBS stations are in the same city, one is the forwarding node on 14.109, another is an HF BBS on 14.107. Traffic is moved between those HF stations on VHF.

5) Any tightly controlled operation attracts problem operators. One type carries the control aspects to an extreme and becomes the Rambo of the airways. These guys have a telephone always ready, they have their eyes glued to the screen, and they never sleep. Any perceived infraction triggers an immediate outbound phone call. Another group can't stand order of any kind and tries to trash the network. Both types are a royal pain in the bit bucket. There is a third type of operator who feels that if a machine is on the air, it's his FCC-given right to use it. The best response I've heard to that one is, "I give him the same access remotely that I'd give him if he were in my shack."

The question the packet community has to answer is whether or not the disadvantages expressed in 1 and 2 are a reasonable price to pay for the increase in network performance. Lest some think that I'm talking about turning the amateur packet radio network into a common carrier, I'm not. An efficient network, or the experimentation to see how efficient we can make it, certainly falls within the boundaries of this oft-quoted passage:

"[Amateur radio is] a radiocommunication service for the purpose of self-training, intercommunication, and technical investigations carried out by amateurs, that is, by duly authorized persons interested in radio technique solely with a personal aim and without pecuniary interest."—Article 1, section III, paragraph 3.34, *Radio Regulations*, Geneva, 1979.

Next, can the general amateur population support number 3? They've gone along, more or less, with the SSTV calling channel and the 14.000-MHz beacon network.

Finally, can the forwarding node operators support the facility mentioned in number 4? Can they live with the operators in number 5 and still have fun?

If we can make it work on HF, maybe we can try a cellular approach to VHF network devices, where users intentionally limit their output power and pattern so as to avoid interference with other network devices. More about that another month.

I mentioned some packet newsletters a few months ago and thanked them for sending me copies. I'd like to mention two more, *SANDPAC* from the San Diego club and *RMPRA> PACKET*, the Rocky Mountain gang. Next month, check in to see if I made my plane to Boston.■

ABOVE AND BEYOND

Number 13 on your Feedback card

Peter H. Putman KT2B
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PREAMPLIFIERS

As you are reading this, no doubt Santa Claus has come and gone and hopefully left you with some nice VHF/UHF goodies! Maybe it was a new beam...a new amplifier...a multimode, perhaps...or a transverter...? One thing is for certain: There's no shortage of equipment today for the VHF/UHF enthusiast. To my count, right now there are more than 20 companies that come to mind that make a broad range of equipment—from exciters, amplifiers, and receivers to antennas, converters, and transverters. And this doesn't include the basement operations that show up at flea markets selling home-brew preamps, antennas, and the like.

What's the most popular piece of VHF equipment? My guess is that it would be a preamplifier. I have yet to meet a ham of any type who feels his or her radio "hears" well enough, especially at 6 meters and above. Which brings me to this month's topic: preamplifiers and how to determine if they are working as they should.

The number most of us are concerned with when discussing preamplifiers is gain, expressed in decibels (dB). Many preamplifiers are sold strictly on gain figures with no consideration for any other parameter—yet those other parameters are just as important (if not more important). Such things as MDS, IMD, and 1-dB COMP need to be considered as well. "Hey, what were those abbreviations?" I hear you asking. Let's go through them one at a time.

MDS stands for minimum discernible signal. This is the absolute lowest level signal that can be detected by the preamplifier and is usually measured with a signal generator driving the preamplifier into a spectrum analyzer, usually in a very narrow bandwidth (say 1 kHz). The limitations here are the atmospheric noise (more of a limitation at 220 MHz and down), the device noise (more of a limitation at 432 and up), and the gain of the device used in the preamplifier. Typical MDS readings might be as low as −120 dBm for a well-designed MOSFET preamplifier and −130 dBm for a GaAsFET device.

Another parameter that goes hand in hand with MDS is dynamic range, the range over which the preamplifier is linear. How is this determined? First, we need to determine the 1-dB compression point (1-dB COMP) as mentioned earlier. This is the point at which the preamplifier's gain figure drops by 1 dB for a given signal input level. Usually, this level will be very strong—on the order of −20 dBm or better. When a given input signal can no longer be amplified by the specified gain figure, we say the preamplifier is compressing at that point—hence, the term 1-dB compression point.

For a well-designed preamplifier, the 1-dB compression point should be in excess of 0 dBm. Some preamplifiers I've measured have been as high as +7 dBm (outstanding!) and as low as −6 dBm (mediocre). What does it mean to you as a preamplifier user? Well, consider that most preamplifiers available today have enormous gain bandwidths. At 432 MHz, a gain bandwidth of better than 10 dB over more than 20 MHz is not unusual. A preamplifier rated at 20 dB at 432 MHz could easily have 18 or better dB of gain at 440 MHz.

If you live next to or near a strong repeater at that frequency, your preamp will amplify that undesired signal to the tune of 18 dB. But if that signal is already better than −20 dBm to begin with (a very strong signal, indeed) and your 1-dB COMP point is only −4.5 dB, your preamplifier will start to compress and become nonlinear. And we all know what that means—intermodulation distortion (IMD) products are created on the signal you wish to hear, creating all kinds of signals and garbage on that weak signal. Horrors!

If you live in a high rf density area (such as a major metropolitan area) or near a hilltop with multiple radio services (such as repeaters, TV or FM stations, and public-service links), you could be asking for trouble by using that super-duper gain preamp to the point that you'd be better off without it. No question about it, you need a preamplifier with a wide dynamic range figure!

Let's get back to that preamp with 20 dB of gain at 430.00 MHz. The MDS is −125 dBm, not bad. The 1-dB compression point is only −2 dBm, not so good. That means the dynamic range is only 103 dBm, which, although adequate, can be improved.

Now, let's look at a typical GaAsFET preamplifier running only 12 dB of gain. The MDS tests out to −130 dBm in a 1-kHz bandwidth. The 1-dB compression point is +5 dBm, which is very good. Now the dynamic range is 123 dBm, a full 20 dB better than the first preamplifier and probably a better choice in your installation, since strong adjacent signals aren't going to blow your front end away while you're trying to work that new grid square just one-half S-unit out of the noise.

Past experience has led me to several conclusions: First of all, gain isn't everything. Preamps I've tested with only 10 to 12 dB of gain often far outperform preamps with 18 to 20 dB of gain when it comes down to those magic letters...IMD, MDS, and 1-dB COMP. Next, it makes no sense in any event to run 20 dB of gain into your multimode's MOSFET or GaAsFET front end if it will exceed the 1-dB compression point of that same front end. Then you're really asking for it!

"How much are you giving up if you forsake that 20-dB preamp for 10–12 dB of 'clean' gain?"

The best designs for widest dynamic range and gain employ a balanced mixer with a well-designed low-noise preamp running about 12–15 dB gain ahead of it. This results in the best receiver performance possible, and indeed designs like this are now showing up in amateur equipment for 50 and 144 MHz. One that comes to mind is the new Microwave Modules MMT-144/28R transverter, which employs an NEC GaAsFET running about 12 dB gain to a balanced diode ring mixer. Let me tell you, it is an outstanding contest performer.

So how much are you giving up if you forsake that "wild," unrestrained 20+ dB preamp for 10–12 dB of "clean" gain? On a signal that is S1, a 12-dB preamp will raise it two S-units to S3. Fifteen dB will raise it to S3-1/2, while 18 dB will raise it to S4, but might also create some other interesting junk, such as a television program from an adjacent television transmitter reading S7, driving you crazy trying to figure out what it is on SSB or CW. Of course, if things get slow, you could actually switch to FM mode (if you have it) and try to listen to that 200-kHz-wide signal for kicks.

At my station, I use the MMT-144/28R with the companion MML-200-S power amplifier, which also has a 12-dB preamp with excellent dynamic range. At times I switch in the preamp, putting 12 dB ahead of 12 dB for a total of 24 dB of gain. Now, when there's no strong local activity, I can get away with this. Should a local come on with some power, "good-bye, DX contact" as I'll hear nothing but hash. Therefore, the preamp stays out of the line most times as the GaAsFET front end in the transverter is more than adequate.

Just remember those magic letters—MDS, IMD, 1-dB COMP—and you won't go wrong with a preamp. Reputable manufacturers will readily make this data available to you upon request.

KLM Price Increases

What's up, KLM? Has anyone looked at the prices for KLM antennas recently? Holy cow! An average of 80% increase in many cases for such items as the JV-2 J-Pole 4-element, 2-meter beam and more than 50% on such items as the 144-16 LBX and 22C antennas! I'm not sure what's going on at KLM, but I can tell you that many amateurs are very upset at these price increases. It seems that the VHF/UHF line took the hardest shots. The aforementioned J-Pole went up nearly 70 dollars in price...unbelievable.

This certainly puts KLM at a competitive disadvantage with such manufacturers as Cushcraft, Tonna, Hy-Gain, and others! Couple this with KLM's previous problems of miscut coaxial baluns for their long-boom 144 and 220 antennas (resulting in feedpoint impedances of 2:1 or higher) and what you have is a line of antennas that may become extinct. Already, many dealers are grousing about dropping the product line due to excessive pricing. That would be too bad, for KLM has long made some of the best antennas around, including those work

horse 4-element beams (one of my favorite antennas—I use five of them in various applications, including my beat-to-heck mountaintop version!).

Well, there are other sources for antennas. Cushcraft still sells a 4-element beam for about half the price that works just as well. And I've come across an interesting new product made by Tonna Antennas: a 9-element, portable 2-meter beam using nothing but wing nuts for assembly! This will become my portable 144-MHz antenna from now on, with the 4-element KLM relegated to test-range duty. I'll try to have a report on this antenna for you in the next month or so.

PackRats Review

I've mentioned the Mt. Airy VHF Radio Club in the past. I've also mentioned their excellent PackRats Flea Market held every October, and this year's edition was one of the best I can remember. Several major dealers were there, and there was a wealth of surplus VHF/UHF/SHF equipment to be had, as well as other flea market bargains. Among the more interesting items was a cute little 13-cm transverter made by LME Electronics of England and sold by DownEast Microwave. This unit is also available in 23- and 33-cm versions, with two different power levels, and as a kit or wired. (Phew! Think that's enough options?)

Bill W3HQT is the proprietor of DownEast and also sells a fine line of loop yagis for 33, 23, and 13 cm, as well as power-amplifier modules for those bands. I suggest you contact Bill for a catalog at DownEast Microwave, Box 1655A, RFD #1, Burnham ME 04922; (207)-948-3741. He has a nice catalog and price list. I'll try to pry one of these transverters loose for a review in a future issue.

Another interesting display was made by Jacob Schmidt and Son, Inc., who deal in stainless steel and have a wide variety of hardware including U-bolts and clamps for antenna work. Their catalog can be had by writing to: 1908 Sumneytown Pike, Harleysville PA 19438.

VHF Shop Update

I can now state that The VHF Shop has officially gone out of business and is in the process of liquidating inventory at local hamfests. Tom Waldron KQ3R showed up at the PackRats with a table full of nondescript Mutek, SSB, and Tonna items at greatly reduced prices, sending many hams home with a bargain.

Tom also told me that he is not taking any more mail or phone orders, so if you still wish to purchase some of the products Tom was distributing, be aware that Hans Peters VE3CRU of Transverters Unlimited in Canada (PO Box 6286, Station A, Toronto 1P3 M5W, Canada) carries the Mutek and SSB line (416-759-5562), as does Gene Shea KB7Q of "Q" Products, 417 Staudaher Street, Bozeman MT 59715; (406)-587-9150.

Letter of the Month

Harry Johnson NV7K writes in to ask how he can use his VTVM to read out power and swr. Simple! Use the VHF/UHF wattmeter board from the "Elementary, My Dear: Watts 'n' Swr" article (September, 1984). I've got about 15 left for the grand total of $10 per board. Although they were designed to work into a 50-uA meter, there's no reason why you couldn't use them with your VTVM—or VOM for that matter. If you have a Simpson 260 with a 50-uA scale, you're in business already.

Failing that, a time-tested circuit has been available for years using the Monimatch (mentioned in the October Above and Beyond) in the ARRL *Handbook*, and it too can be connected to a VTVM or VOM for readout. I hope this helps out!

Finally, it is January again, and that means the ARRL Sweepstakes. This is an excellent time to check out your station's performance (especially due to the abundance of weak signals on the air) and have some fun as well. The contest runs from Saturday afternoon to Sunday evening, and you'll see activity on 50, 144, 220, 432, 902, and 1296 MHz, as well as the occasional microwave contacts on 13 cm and above.

I have just finished remodeling my basement ham shack, putting in styrofoam insulation and sheetrock where there used to be masonry exterior walls. Boy, it's a lot warmer in there now!

If you are near the East Coast, look for KT2B on 6 through 1296 during the weekend. I might still decide to go mountaintopping with snowshoes and cross-country skis on 144 and 432 MHz from FN22 with the new 9-element F9FT antenna and who knows what radios. Until then, see you Above and Beyond! ■

QRP

Number 24 on your Feedback card

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HAMFEST GOODIES

The last several columns should have put your junk box in very good condition. I hope some of my hints for mail ordering have paid off. There is but one more place to look for parts to finish stuffing the junk box: hamfests. It is true that in the past few years, the number of hamfests have been dropping, perhaps due to the drop in new hams coming into our hobby. But, they are still gold mines for part shopping—even if not for new parts, then just for plain junk.

As an example, a broken 23-channel CB radio is junk to most people. To the low-power operator, it is a treasure chest full of goodies. With a little bartering, you can purchase one for less than five dollars. From the unit, you can expect at least one speaker, a microphone, a 4-Watt final transistor, various low-level driver transistors, and handfuls of smaller components. That's not a bad haul for a few dollars.

I gut, sort, and test all of the above parts. I don't worry about the smaller resistors or ceramic capacitors. It's just not worth the effort to remove them. I can purchase all of the resistors new for less money and time than it takes to remove them from a printed circuit board.

I for one like to build my equipment from solid-state devices. Those old CB radios are a good source of parts. But have you ever given thought to building something with tubes? Please don't get me wrong. I like the technologies of the 80s. I also like a good bargain when I see one. I'm talking about the old mobile radios. There are several different models, most made by Motorola, General Electric, or RCA. I have seen them go at hamfests for as little as a buck each.

So, what good are they? Well, they are just full of parts—tube-type parts. Most have a 6146 tube as a final, a 2E26 driver, and perhaps even a 12BY7. The power-supply components alone are worth more than the price of the radio. One has only to try running a home-brew transmitter using a tube or two to really feel the ham spirit. I have been operating a 6L6 one-tube job for a year or so. If there is enough interest, I'll print up the plans here in this column.

I have noticed several things when I see someone else's home-brew gear—a lack of good-looking cabinets. I always try to pick up a good-looking box or chassis when I shop the hamfests. It is hard to buy a chassis or cabinet by mail. The pictures are never very good; neither are the descriptions. The extra shipping cost will eat you alive. I like to be able to handle and eyeball the cabinet. Don't forget Radio Shack for a source of good-looking boxes to house your QRP project in. The new styles they carry are not too bad.

To finish stocking up on the junk box, how about a good hunk or two of copperclad board? Get some double-sided stock as well. It's great for shielding and for making up small cabinets. Soldered together, it makes for a strong chassis.

Building an Swr/Wattmeter

Now that we are finally done with the parts, let's put something together. A low swr is very important to the QRP operator, as high efficiency is one of our many goals. Running low power is the acid test for your antenna system. With a handful of parts, you can construct a sensitive swr/wattmeter very easily. The small wattmeter shown in Fig. 1 is a classic in design. I take no credit for it. Several different styles have appeared in several different magazines.

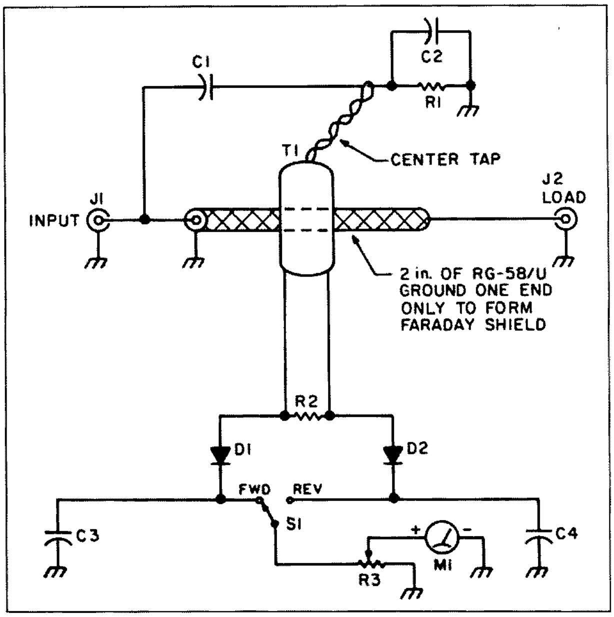

Fig. 1. Swr/wattmeter.

As little as 1 Watt will deflect the meter full-scale, with a frequency coverage from 1.8 MHz to 30 MHz. There's not much to it. The signal traveling in from the transmitter to the antenna establishes an electric field between the inner and outer conductors and a magnetic field around the conductors. The line from the coax forms the primary of the transformer, T1, and so the alternating magnetic field induces a voltage in the center-tapped secondary winding. That winding is loaded by R2, a 56-Ohm resistor. C1 samples the electric field and is adjusted so that when the load on the output side is 50 Ohms resistive, the voltage injected into the tap of T1 aids the voltage in one half and exactly cancels the voltage in the other half. Any load that departs from 50 Ohms resistive will cause less cancellation and will be indicated by the meter.

I used a Bud seamless aluminum box to hold the wattmeter. It's die-cast aluminum—very easy to work with and rf-tight. At this power level (less than 20 Watts), a plastic utility box could be used. However, I like to place rf test gear in a metal cabinet if possible. Radio Shack provided me with copper perfboard to mount the parts on. The junk box supplied a very nice 50-uA meter. All components are self-supporting and are mounted directly to the perfboard. Do be sure to use 1N34 diodes in the bridge. The more popular 1N914 diodes have too high a junction voltage to be used at this power level.

Check over the wiring for errors. With a 50-Ohm resistive load connected to the output, apply a small amount of rf. Adjust R3 for a full-scale meter reading in the forward position. Apply more rf if needed. Switch S1 to read reflected power. Now adjust C1 for minimum reverse power indication. Repeat the above adjustments on the highest band to be used. The swr/wattmeter can now be calibrated as needed. My meter came with a nice faceplate, so I left it as is. Apply some paint and rub-on lettering and you're done. The swr/wattmeter will find a good

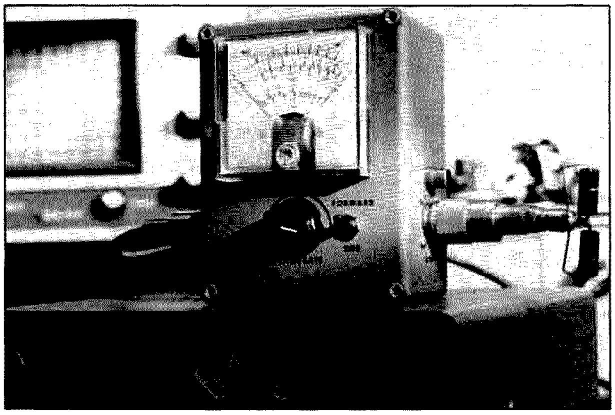

Photo A. The QRP swr/wattmeter shown with the HW-8, built using junk-box parts.

home next to your latest QRP transmitter.

Let me switch gears for a moment. If you'd like to see small projects like this in the QRP column, drop me a note. There are quite a few smaller projects that can be discussed here. Remember, it's your column.

SOFTWARE EXCHANGE

Since we're switching gears, let's drop down to four-wheel low. The operator of low power has to get the most out of his/her equipment and antennas. Optimum efficiency sometimes requires tweaking and pruning in the smallest degree. Close only counts in horseshoes and hand grenades—not in QRP.

In an effort to get the most out of the QRP operator's equipment, about six months ago I started collecting public-domain ham radio programs for a software exchange. Antenna design, MUF plots, and power-supply designs are just a few types of programs that are available. Right now I can support the following formats and machines: IBM/MS-DOS; Apple II, //e, and //c; the Radio Shack Color Computer (with both disk and tape support); and the Commodore 64 (disk only).

Currently, I have public-domain programs for all the above except the C-64. Where is the large software base for this machine? Several people have already taken advantage of the exchange. To get the programs, tell me what machine you want the programs for. If you want just a listing of programs for that machine, an SASE will bring it. To get the programs, either send a formatted disk with return postage and a note listing the program(s) wanted or send me $2 per disk, and I will send you a GOOD disk with the desired programs copied on it. I make no money from this. The cost covers the disk, disk mailer, postage, etc.

Please also send me your public-domain programs to add to the growing exchange. I'll copy your disk and return it with some different programs. Into programming? Send me your creation for the exchange. The more software I receive, the more we can exchange. Right now, there is a good supply of programs for the CoCo and Apple series. I just started to get some for the MS-DOS-based machines—two very fine CW/RTTY programs.

That's about all for this month. With the snow on the ground and the cold winter nights, look for me on 40 CW—QRP, of course! ■

Swr/Wattmeter Parts List

C1	5–25-pF trimmer capacitor
C2	270 pF ± 5%
C3, C4	.047 pF
R1	1k, 1/2 W
R2	56 Ohms
D1, D2	1N34 germanium diodes
T1	15 turns #20 on FT-50-43 core
M1	0–50-uA meter
S1	SPDT switch
J1, J2	Coax connectors

HAMSATS

Number 17 on your Feedback card

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WELCOME, ANDY

All right! A satellite column! You'll find out about Videocypher II crackers and pirates, HBO and Cinemax de-scramblers with only two chips, perfect C-band reception with a 12-inch dish, and complete systems with 30-degree LNAs for only $29.95 postpaid. Right? Well, not quite. But now that I have your attention, I am going to explore some topics with this column that are potentially more exciting than all of the above.

I enjoy my TVRO (television receive only direct via satellite), but if all I wanted to do was monitor, I wouldn't be a ham. My amateur radio license is my ticket to talk. Why just listen or look when I can do my own broadcasting? How about packet QSOs through a "mailbox in the sky" or RTTY contacts via a Russian satellite? Watching "raw feeds" of football games can be entertaining, but it's nothing like the thrill of chasing an elusive country on a low, horizon-skimming OSCAR pass.

After several thousand QSOs through every transponder-type satellite since AMSAT-OSCAR 7, my enthusiasm for the amateur radio satellite program is stronger than ever. The OSCAR (orbiting satellite carrying amateur radio) program neatly combines my interest in the space program, computers, and amateur radio.

By the way, Wayne Green introduced me to this hobby back in 1966. My father picked up a copy of *73* at the local English bookstore in Tehran, Iran, and I was on the air as WN5ZIB within months of my arrival back in the States. I am as active as possible on the satellites and with AMSAT (the Radio Amateur Satellite Corporation), but two preschoolers and the XYL (WB5RMA) put certain constraints on total immersion into satellite chasing.

With this column, I will have plenty of room to cover how-to topics, newcomer hints, new satellite proposals, awards, contests, and news, though situations in the world of the "hamsats" can change very rapidly.

Enough introductions. Where do these "birds" come from? How did the amateur radio satellite program get started, and what can you do NOW to learn more about the satellites and do some chasing of your own?

Photo A. Mike WA5TWT in his well-equipped satellite station.

The Growth of Satellites

It was 25 years ago, December 12, 1961, at 2042 UTC, when an Agena-Thor rocket lifted majestically skyward from Vandenberg Air Force Base in California with a very special ten-pound box in place of ballast. The box was called OSCAR 1. This small satellite, built by hams, sent "HI" in CW on 145 MHz with 140 milliwatts to a simple whip antenna. During its 22-day life, hundreds of hams in dozens of countries heard this signal from space. Amateur radio, a hobby, had joined the space age only four years after *Sputnik 1* became man's first artificial satellite to orbit the Earth.

Since that memorable day a quarter century ago, the concept of amateur radio satellites has flourished. The OSCAR Association of Sunnyvale, California, the group responsible for OSCAR 1, later became Project OSCAR, Inc. They exist today supporting AMSAT, whose main purpose is to provide satellites for amateur radio communication and experimentation.

Efforts to create new satellites continue with affiliated groups worldwide providing space-ready hardware. Some of the countries directly involved include the United States, West Germany, Japan, the United Kingdom, the Soviet

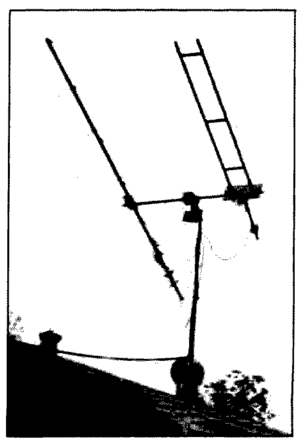

Photo B. WA5TWT's antennas: KLM 14C for two meters and a home-brew 10-turn helix (right-hand circular) on 70 cm.

Union, Australia, France, and Hungary. Other groups providing support include New Zealand, Canada, South Africa, Brazil, and Mexico. Our most recent hamsat, Fuji-OSCAR 12, was designed and built by Japanese hams and then launched from Japan on August 12, 1986 into a 1,500-kilometer circular orbit.

Satellite Spectrum

Amateur radio satellite activity is not a specialized mode of communication like packet, RTTY, facsimile, or slow-scan television. The hamsats represent NEW HAM BANDS. Each time a satellite goes up, we have new space to make contacts with other hams. You might say that the space already existed as ham frequencies, but for the most part, the satellite-allocated subbands are in unused areas of VHF and UHF amateur allocations.

Mode L on AMSAT-OSCAR 10 used a 1269-MHz uplink with a 436-MHz downlink to provide 800 kHz of operating room. That's more spectrum than the 40-, 30-, and 20-meter bands combined. With the exception of fast-scan TV, you will find many of the "specialized modes" of amateur radio in use on the ham satellite transponders.

Uo-9 and Uo-11

You probably have ham rigs on hand that can get you started with amateur radio satellites right now. ANY two-meter rig in reasonable condition can hear UoSAT-OSCAR 9 and UoSAT-OSCAR 11. These experimental scientific and educational spacecraft were built at the University of Surrey in England and launched as secondary payloads on American boosters into low polar orbits. Uo-9's altitude is almost 500 kilometers, while Uo-11's is almost 700.

They transmit telemetry on either the two-meter band or the 70-centimeter band. Except for special experiments, the two-meter frequency is preferred. Set your handie-talkie, mobile rig, or home station on 145.825 MHz FM. Eventually, one of the two UoSATs will come over.

The signal format can be anything from synthesized voice to CW, RTTY, or ASCII. Typically, expect to hear 1200-baud ASCII. If you have a 1200-baud modem handy, hook it between the rig and your home computer for some interesting bulletins or telemetry. Uo-9 and Uo-11 can each be heard about six times every day, for about 15 minutes per pass. Dr. Robert Diersing N5AHD wrote a very detailed paper on automatic station control, data acquisition, and telemetry processing, but for a quick introduction to the hamsats, just hearing signals from space with an HT is amazing.

Fuji-OSCAR 12

But what about the communication-type satellites? The newest and most reliable one is Fuji-OSCAR 12. This satellite uses a two-meter uplink and a 70-centimeter downlink and has two transponders called JA and JD. The "J" refers to the frequency configuration of 145 MHz up and 435 MHz down, while the "A" stands for analog and the "D" for digital. When the JA transponder is on, the JD system cannot be used. The reverse is also true. The analog transponder is continuous and is intended for SSB, CW, RTTY, SSTV, FAX, or similar signals, while the digital transponder is for AX.25 packet communications.

The analog transponder is 100 kHz wide and is inverting. When you transmit an LSB signal below the center of the passband, the downlink will be USB and above center. Fig. 1 shows the analog transponder band plan. The use of circularly polarized beam antennas, low-loss feedline, and a preamplifier will be rewarded with quality contacts on FO-12.

Several multimode rigs are available today for use with mode J. Some of those used most often include the Yaesu FT-726R, the Kenwood TS-711 and 811, and the ICOM IC-271 and 471 series. In my case, two Yaesu HF rigs with appropriate receive and transmit conversion make almost any "mode" possible. Those hams with inconvenient setups—ones that require wiring changes or system modifications before every operation—make few contacts and soon lose interest.

The digital transponder, mode JD, uses discrete channels rather than a continuous band of frequencies. When this mode is in operation, the analog transponder will be off, and FO-12 becomes a store-and-forward mailbox like an orbiting packet digipeater with a computer. This "digi" has coverage of much of the Earth's surface in the course of a day. A message could be left for a friend in California as easily as for one in Australia. The uplink channels listed in Fig. 2 require FM, while the downlink is SSB.

The standard packet station will need a few extra items to allow compatibility with the satellite. These include antennas suitable for satellite work, a 435-MHz SSB receiver, and an interface box to go between the TNC and the radios.

Mode JD is new and is not for the beginner. Experience with the analog mode on FO-12 and knowledge of terrestrial packet activity on two-meter FM or HF are helpful.

Other Birds

We have other amateur radio satellites in orbit. Any attempt to second-guess their status at the time this material goes to print would be impossible, but a description of their present situation is in order.

AMSAT-OSCAR 10 was launched in 1983 on an Ariane rocket to a high elliptical orbit. For several months now it has suffered many setbacks due to progressive memory failure induced by radiation damage. Many attempts have been made to reverse this problem, but with few results. Rescue efforts will likely continue as long as there is any chance to squeeze more useful life from this extraordinary international hamsat.

It carries two transponders, one for 435–145-MHz operation and another for 1269–436-MHz operation. The nature of its orbit has allowed DX contacts almost to the opposite side of the Earth.

The Soviet Union has been responsible for no less than ten amateur satellites in recent years. They include the "Radio" and "Iskra" series. Radio 7, the best satellite from the last group to be launched (1981), may still be available for communications, but its failing batteries have resulted in reduced operating schedules whenever eclipsing of the sun takes place. The Iskra satellites usually last only a month or two and have yet to do more than provide beacons on ten meters.

The transponder on Radio 7 uses a two-meter uplink and a ten-meter downlink with a beacon frequency of 29.501 MHz. In the months to come, we expect at least three new Soviet amateur satellites, including Radio 9, Radio 10, and Iskra 4.

Suggested Reading

Just a few years ago, it was difficult to find sufficient data on ham radio satellites without gathering quite a pile of old magazines, obscure journals, and books. To get a really good single source of in-

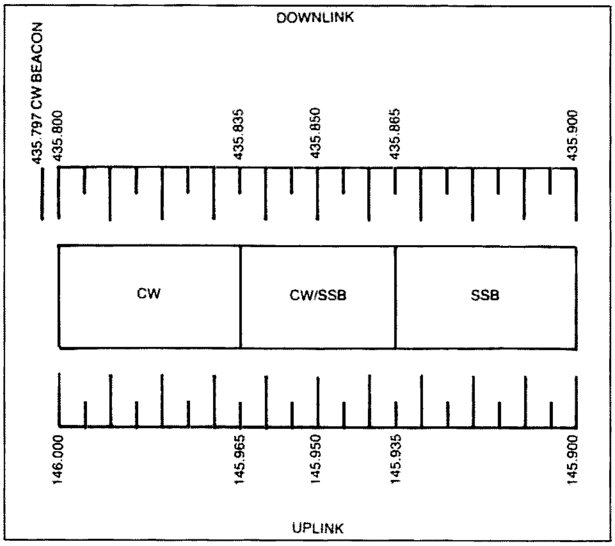

Fig. 1. Fuji-OSCAR 12 analog transponder channels.

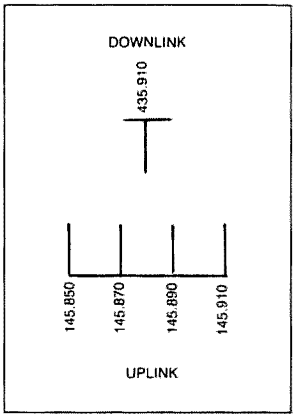

Fig 2. Fuji-OSCAR 12 digital transponder channels.

formation, I would suggest a copy of *The Satellite Experimenter's Handbook* by Martin Davidoff K2UBC. It is available through AMSAT for $10 postpaid to The Radio Amateur Satellite Corporation, PO Box 27, Washington DC 20044.

For more information on Fuji-OSCAR 12, Project OSCAR has the *JAS-1 Satellite Handbook*. It was originally printed in Japanese but has recently been translated into English. The price postpaid is $10 to *JAS-1 Satellite Handbook*, Project OSCAR, Inc., PO Box 1136, Los Altos CA 94023-1136.

To keep up with changes in satellite status, the *Amateur Satellite Report* from AMSAT is sent to members at least once a month. This newsletter provides orbital tracking data and information on upcoming missions and present projects. The membership fee of $24 per year (from the Washington DC address above) helps pay for new satellites.

If you have OSCAR-related questions, send them to me. Although I cannot respond to each individually, I will be covering many topics in the months to come and would really appreciate the input.■

RTTY LOOP

Number 26 on your Feedback card

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

The most obvious way to begin this column, of course, is by wishing each and every one of you a HAPPY NEW YEAR! It may be overdone, but as each year ticks by, I look into my children's eyes and wonder what the next century, just a baker's dozen years away, will bring, not only to electronics and ham radio, but to our entire way of life. It does make one pause and think.

One of you who did take a few moments to think was Frank Fox WA6KGD of Hayward, California. Frank provided the first answer to the "Green Keys" question, remarking that he has "sat many a night and punched the 'Green Keys' (cushioned at that) on a Model 15 Teletype®. For that matter, I punched the same keys on a Model 21 Teletype." That's right, those of you who never laid eyes, much less hands, on an original mechanical monster, the keyboards of the classic Teletype Corporation machines were made up of green keys, thus the moniker "Green Keys" for this hobby of ours.

Frank also addresses one of the expressed needs of several of our RTTYphiles—running RTTY on an Apple *//c* computer. He tells me that he purchased the rights to market Super-RATT, originally written and marketed by Richard Landsman, and has maintained his interest in keeping "one of the best communication programs alive and well. The program works on all Apples including the *//c*.

"The program can be used with virtually any terminal unit; in fact, there are several options in the configuration program, including the Alex Masimo internal Terminal Board for the Apple, the HRA terminal unit, and terminal units that had been wired up to use the game I/O for the Galfo program.

"The program is primarily a machine-language program, which lets it operate in a speedy manner and is interfaced rather neatly with a Basic program that lets the user make changes in the program to suit his needs. The Apple when powered up automatically boots and runs any predesignated program in drive one..." so that using the program is simple and convenient.

The manual is supplied on disk and is more than 50 pages in length. It comes in standard Apple file format, so that it can be printed out with a word processor program or the short Basic program provided on the disk.

Now I hear some of you clamoring in the back for a few details on this program. A quick rundown includes RTTY speeds of 40 to 300 baud and Morse from 5 to 100 wpm, with Baudot, Morse, and ASCII capabilities. Both a bulletin board system and selective call are included in the program. A receive buffer, initially set at 10K, is included, and information can be saved to or retrieved from disk. A split-screen display holds all kinds of information, and there is even a simplified QSO log on screen.

More? I don't know...how about a word or character mode of transmit, automatic carriage return, real-time hard copy with printers that sport a buffer, automatic or selectable ID, temporary string storage, file transfer mode, bit inversion, even on-line help? How much longer do I have to go on? This does, from the specs at least, look like its name "Super-RATT."

Go ahead and drop Frank a line at 186 Isabella Street, Hayward CA 94544, and tell him you read about it in *73*'s RTTY Loop. I'm sure he will be happy to send you the full details. And any users of Super-RATT, let me hear from you as well.

One user I have heard from is Frank C. Krushina K4DW of Merritt Island, Florida, who is using Super-RATT with his Apple *//e*. He didn't complain, so I guess he likes it. Huh, Frank?

Robert L. Dingle KA4LAU of Dayton, Ohio, writes that he is trying to get the TRS-80 Model 100 RTTY program shown in the July, 1986, RTTY Loop working on his NCR Decision Mate V computer. He says that all he got was an error message that said, "SUBSCRIPT OUT OF RANGE LINE 120." Assuming that this is a similar machine to the Model 100, my only guess is that the line may have been entered wrong. The listing as shown in the column used a form of "pretty printing" that lined up the contents of the line with the text following the line number. The line should read:

```
120 F$=" 3"+CHR$(10)+"_
 "+CHR$(7)+"87"+CHR$(13)
 +"$4',!:(5"+CHR$(34)
 +")2#6019?8 ./;"
```

Watch out for the spaces. There

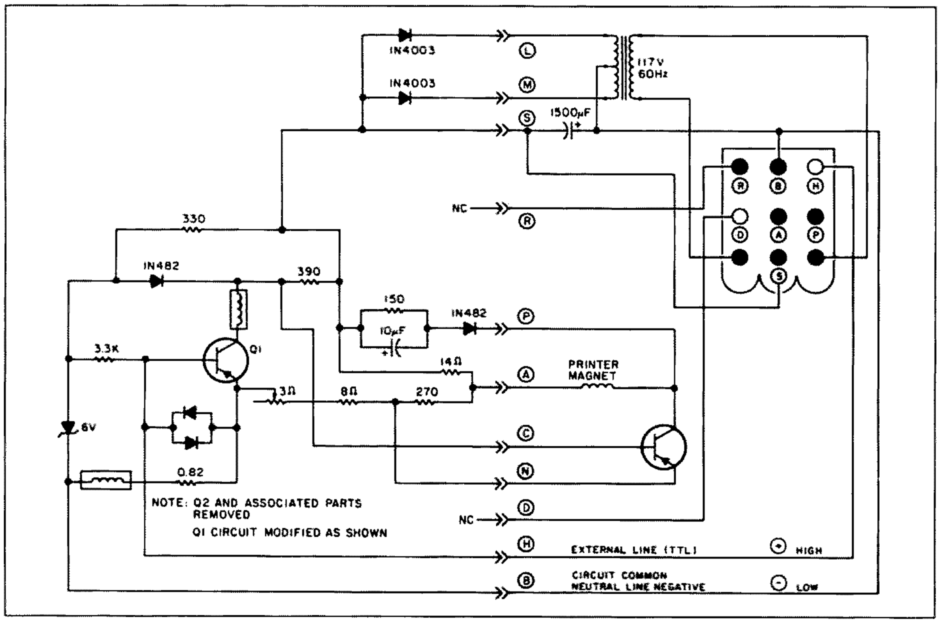

Fig. 1. Model 33 ASR TTY printer magnet driver board (as modified for TTY level signals). Note: Q2 and its associated parts have been removed; the Q1 circuit has been modified as shown.

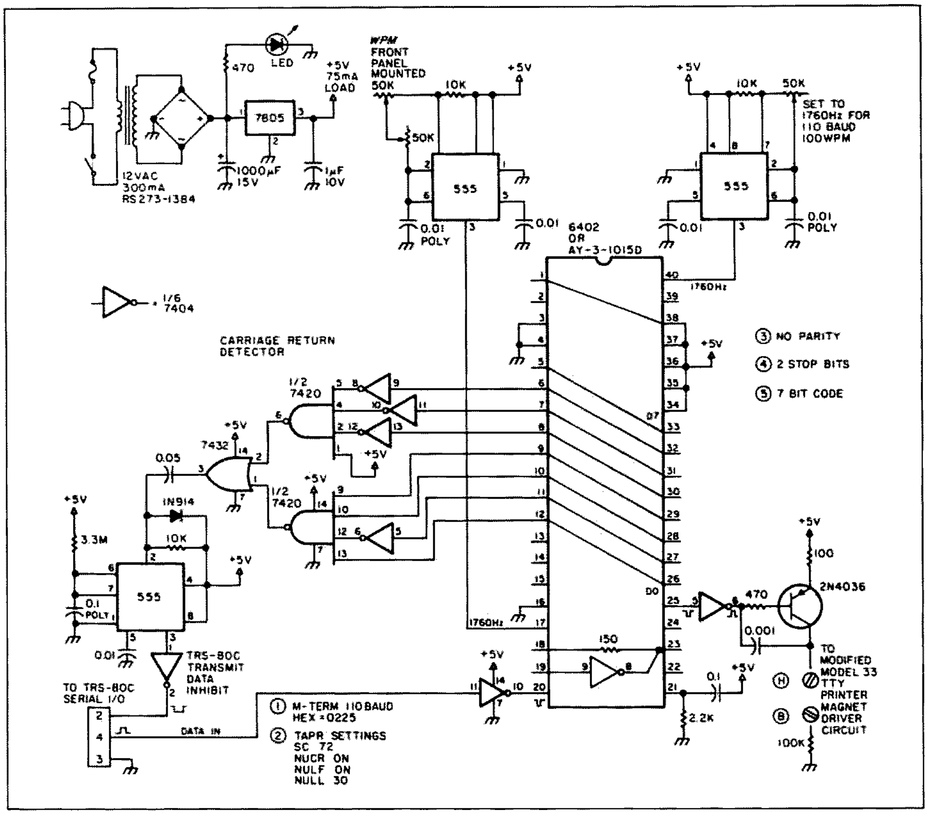

Fig. 2. Interface unit diagram. Hard copy with a Model 33 ASR.

should be one in the first quoted string (space 3) and in the second, after the CHR$(10) (underline space). There is one more, in the last string, between the 8 and the period. If you count the characters in the string, with each CHR$() as one character, you should get 31 characters. The Baudot LTRS character set is in L$, and the FIGS character set in F$. They should both be the same length and represent the same characters in the same order, just with a different case. Let me know if this solves the problem.

Some time ago, Louis I. Hutton K7YZZ of Bellevue, Washington, acquired a Model 33 ASR Teletype machine to replace a Model 28 KSR that was connected to his Digital Group Z-80 computer. The problem with the Model 28 was that when the print driver routine was changed from Baudot to ASCII, an ASCII-capable machine, such as the Model 33, was needed. Once a modification to the Model 33 to allow driving with TTL-level signals from the Digital Group computer was accomplished, all was working just fine.

Then Louis got interested in packet and assembled a new computer system to replace the Digital Group. The computer picked was a TRS-80 Color Computer, but when he tried to connect the Model 33 to the RS-232 output of the CoCo, he had a few problems.

Louis notes that the printer would print right across the page and pile up at the end of the line. It apparently did not recognize the carriage-return and line-feed signals from the computer. During a literature search for data on the Model 33 and its applications, he found several hints on possible solutions to this problem. First, the computer was programmed to limit its line length to 72 characters. Then a circuit was designed to tell the computer to stop sending and wait until the Model 33 had finished its carriage return and line feed when it reached its 72nd character or when it received a CR/LF from the computer. The computer was also programmed to send the data at 110 baud, the speed needed to talk to a Teletype machine.

Fig. 1 is a diagram of the modifications Louis made to the printer magnet driver board of the Model 33 ASR to allow driving with TTL level, rather than 20-mA current loop levels. It should be noted that transistor Q2 and its associated parts have been removed; modifications to the circuit of Q1 are as shown.

In order to provide a hardware detection of a carriage return, and thus force a hold on data transfer while the type basket returns, the circuit in Fig. 2 can be constructed.

According to Louis, the data signal is taken from the RS-232 port of the Color Computer and is inverted in one section of a hex inverter to make it compatible with the input of the UART. Two clocks using 555s provide the timing signals for the UART. The input clock is made front-panel adjustable to be compatible with the data signal speed coming from the computer. The other clock is set to the Model 33 printer speed of 100 wpm. The serial bit stream output from the UART is inverted in another section of the hex inverter and drives a transistor printer magnet circuit. The parallel data output of the UART receiver section is cross connected to the data input of the UART transmitter section. These same lines are monitored by the carriage return detector circuit. When that command is received from the computer data stream, it causes the 7432 to trigger a 555 pulse generator. This pulse output is inverted by another section of the hex inverter and is used to inhibit the computer from sending any further data until the CR/LF function has been accomplished by the teleprinter.

A short software routine is used by Louis to set up the computer to output at the proper speed, and with the proper delays. The following could either be typed in directly, in the command mode, or placed into a short program:

POKE 148,1 : POKE 150,248	'Sets baud rate to 110
POKE 151,255 : POKE 152,255	'Sets line delay
POKE 153,72	'Sets
POKE 154,72	'Printer
POKE 155,72	'Width

Louis' solution is certainly one way to solve the problem, but I am inherently lazy and would like to propose another one. How about a software "filter," which watches the output to the teleprinter and forces a delay in software when a carriage return is sent? A few years back, I wrote such a routine for a Selectric driver, and a similar routine for an ASCII-encoded printer wouldn't be too hard. I might add that, once such a filter is "constructed," some more smarts could be added with little difficulty. I'll put something together and let you all see it next time.

Gene Wagner WA7RCR of Longview, Washington, dropped me a letter with his view of RTTY on the ham bands. He says he started out with the old Model 14s and slowly entered the computer age. Now he has an IBM PC with "all the nice things that go with it, and [he has] about 2,400 RTTY pictures in [his] files that [he exchanges] with other pix nuts around the world."

He questions the availability of programs for the multitude of PC-compatible users, however. It is Gene's impression that those of you who are using any of the "clones" out there are shut out from the bulk of good RTTY programs. Is this so? I have heard very little from PC/PC-clone users, and would look forward to some of your input. Let me hear from you, and I'll be more than happy to open a window to all of your experiences.

I have been thrilled at the number of electronic messages I have received, several of which have ended up in this column. Whether on CompuServe (my ppn is 75036,2501) or on Delphi (user-

name is MARCWA3AJR), I am always delighted to receive your electronic comments or questions. I would even venture the statement that, if you did a survey, you would find that the E-mail questions are answered quicker than the posted ones—I think my record E-mail response was while the sender slipped out of the room for a second. Anyway, feel free, as always, to send your comments, questions, or suggestions to me either on-line via the above systems or by way of the plain old Postal Service at the address at the head of this column.

Those of you who may be new to *73*, this being a new year and all, who are reading this column for the first time, may be interested in my periodic offer of reprints from past issues of RTTY Loop. There are about eight editions, which deal with subjects ranging from the basics of RTTY and digital communication to one-chip interfacing circuits. There is a list of available topics, which can be yours for a self-addressed, stamped envelope, sent to the above address.

My next column holds a few predictable items, such as the program hinted at above and a few surprises. Surprises, you say? But of course—otherwise it wouldn't be *73*, and it especially wouldn't be RTTY Loop!■

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Number 15 on your Feedback card

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MICROWAVE VCOs, Watkins-Johnson V901, 3.6 GHz to 5 GHz, $35 postpaid. Send SASE for more info. Stan Bode, 2248 Lockwood, Carrollton TX 75007. BNB499

LONG ISLAND ARRL INDOOR HAMFEST, Sunday, February 15, sponsored by LIMARC at the Electricians Hall, 41 Pine Lawn Road, Melville, Long Island NY. Door opens at 9 a.m. for buyers, no one admitted earlier. Exhibitors at 7:30. Send reservations to Hank Wener WB2ALW, 53 Sherrard Street, East Hills NY 11577. Our 4' x 6' tables are $12 each or bring your own at $1.50 a foot with an $8 minimum. Each table sale admits one person, additional workers at $3.25 each. Check payable to LIMARC must be with reservation. Buyers admission is $4 at the door and $3.25 in advance with SASE. Send check payable to LIMARC to LIMARC Tickets, Mark Nadel NK2T, 22 Springtime Lane East, Levittown NY 11756 by 2/5/87. To avoid overcrowding, everyone must pay an admission. Special gifts will be awarded to some advance buyers. LIMARC VHF rig clinic will be on hand. At Exit 49, north of the LIE, go north a block to Pine Lawn Road, turn right to site. Additional info, call at night Hank (516)-484-4322. BNB500

SIXTY-FOOT JACOBES WIND ELECTRIC STEEL TOWER, twelve-foot square base. Bolted construction, disassembled, can be hauled in pickup. $250. Lonnie D. Wright, Rte. 1, Box 38, Albert KS 67511; (316)-982-4519. BNB501

TRS-80 4P/KANTRONICS UTU RTTY. Split-screen, 10 user keys, file transfer. Runs in Mod 4 (80 char.) mode. $30 to COMMPRO RTTY, c/o KB6IC, 3711 Gayle Avenue, Omaha NE 68123. BNB502

ATTENTION! Kenwood TS-430S, TS-440S, TS-940S; ICOM 745 and 751; Yaesu FT-757GX owners! Modification for general-coverage transmit the right way. $5 each or 3 for $10. Many other mods available. Money order or cash to W. Thomas, PO Box 96, Uniontown PA 15401. BNB503

CLEAN GOODIES. Kenwood: DG.5, digital readout for 520 series, $189; TS-520S with CW filter, $445; R-2000 general-coverage rcvr, $425; TS-830S xcvr, $575. Drake: T4XC xmtr with AC4 P/S, $285; FA-7 for TR7, $35; MN-2000 2-kW antenna tuner, $200; AUX 7 board for TR7, $45; MN-2700 antenna tuner with B-1000 balun, $350. Yaesu: FL-2100B with 10 meters (1,200-Watt amp), $450; FR-1015 with manual, $299; dummy load, 350 Watts, $59. ICOM: IC-740 xcvr, loaded, $625. Tony Musero K3UKW, (215)-271-8898. BNB504

HAPPY NEW YEAR from the Crew at Junior High School 22 on Manhattan's Lower East Side, learning English through amateur radio. Be a winner in 87! Send us your QSL via WB2JKJ, and we might send you our QSL of the Week Award. BNB505

APPLE II+/c/e MORSE CODE PROGRAM. Menus, 31 modes, lesson plans, graphics, word processor, 1-100 wpm, etc. Write LARESCO, PO Box 2018, 1200 Ring Road, Calumet City IL 60409; (312)-891-3279. BNB507

73 INTERNATIONAL

Number 27 on your Feedback card

NOTES FROM FN42

It is increasingly difficult for us to select the material to print here . . . sadly setting aside the rest. Here are some tips to help contributors decide what to send in. In this order, desirable material includes:

1) News items on ham activities in your country which amateurs everywhere will find useful, informative, and/or highly interesting.

2) Reports on licensing requirements and procedures (for visiting hams, but also for residents if special in some way which would be of international interest).

3) Awards and contests that promote inter-nation activities.

4) Human interest stories, historic items, and so on.

For time-critical items, remember: We must receive your information weeks before it can be published! If you want to see something in the April issue, for example, it must reach us by February 1st—by March 1st for the May issue, and so on. Sometimes short items can be dropped into "Roundup" (a new section, see below), even if not received here until 10 or 15 days after the first of a month, but only sometimes!

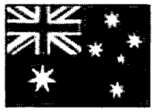
ROUNDUP

Canada. The Boy Scouts staged an impromptu DXpedition to St. Paul's Island (off Cape Breton) last summer, and a couple of amateurs put CY9SPI on the air. Congratulations from VE1CBF! QSLs to VE1BIZ.

Three emissaries of Dionysus, L to R, Aris 5B4JE, Andy 5B4IR, and Nicos 5B4CV.

Cyprus. 5B4JE writes that if you wish "to become, together with the local people, protagonists in a feast of human euphoria . . . to banish every care of life . . . to feel innermost comfort and freedom in an atmosphere of unreserved fraternization [and if you wish] to infuse into your being the rays of the sun, the breath of the breeze, the lucidity of the atmosphere . . . ," then come to the Limassol Wine Festival, the first fortnight of every September, and drink some Cypriot wine, with 4,000 years of wine-making experience behind it. Last September you could have attended in spirit (rather than in spirits) with a contact with special-event station C4LWF. For the first 1,000 cards received through the Cyprus Bureau or via 5B4JE, a commemorative QSL diploma will be sent free of charge, together with a special prefix QSL card. (Watch for more info in this column in July or August if the station is activated again.)

Great Britain. "QTQ?" asks G4FAI, aka Tony Smith, one of the three producers of *Morsum Magnificat*, in the Autumn edition of that quarterly publication. It is the first regular English-language edition of the magazine, which has had a Dutch edition for three years. *Morsum Magnificat* "is for all Morse enthusiasts [bringing] together material, which would otherwise be lost to posterity, providing an invaluable source of interest, reference, and record, relating to the traditions and practice of Morse." A year's subscription is available for a US $10 bill sent to Rinus Hellemons PA0BFN, Holleweg 187, 4623 XD Bergen op Zoom, Holland, who also is a publisher. (Dick Kraayveld PA3ALM is the third). If you want to know how come "i" was the shortest complete telegram ever sent, ask that your subscription begin with the Autumn issue. As the maiden English-version issue, it could become a collector's item, also.



AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

FLASH! THE AULD MUG AWARD

Here in VK6, Australia is defending the right to hold the most coveted trophy in yachting—The America's Cup. In celebration of this important sporting event, the Western Australian Division of the Wireless Institute of Australia is offering an attractive award: The Auld Mug Award!

To qualify for the award, the following conditions must be satisfied:

1) Stations outside Australia (DX) must obtain four (4) points by (a) communication with four licensed amateur stations in VK6 (one point each); (b) communication with the special-event station VK6CUP (four points).

2) VK stations must obtain twelve (12) points by (a) communication with twelve licensed amateur stations in Perth; (b) communication with VK6CUP plus eight Perth stations.

3) All authorized bands and modes are permitted.

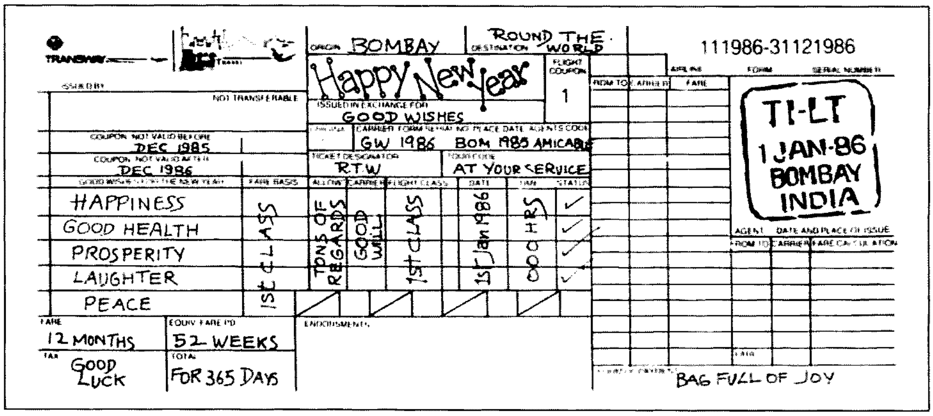
4) All contacts made after October 5, 1986, until the final deciding race in February of 1987 will be eligible.

5) All contacts must be listed showing date, time, band or frequency, and RST report.

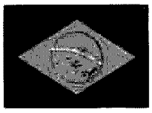
6) Shortwave listeners are eligible as per the above rules.

7) QSL cards are not required as proof of valid contacts, but the application must be certified correct.

Applications should be sent to Awards Manager, W.I.A. (VK6 Division), PO Box 10, West Perth 6005, Australia.



Let this be our New Year's Greetings to you all—just change the dates! This came from (and thank you to) RADIO, *the Journal of the Federation of Amateur Radio Societies of India, for January, 1986. It was a reprint of a card designed by Kamlesh Amin, who is in the travel business.*



BRAZIL

Gerson Rissin PY1APS
PO Box 12178, Copacabana
20000 Rio de Janeiro, RJ
Brazil

In almost every contest one is used to hearing PY4OD—and sometimes ZW4OD or ZY4OD. Talma Drummond PY4OD is surely one of the best contest operators in the world, SSB and CW. The trophies he has won are the best proof of that.

Talma is a lawyer and 57 years old. In 1956 he got his license, and a CW QSO with OH2YU was his first DX. On that occasion he was very excited and almost unable to copy a single word transmitted by OH2YU. After that very difficult QSO, he never stopped. In the same year he took part in the *CQ* WW Contest on 7 MHz, and his first QSO was with JR6AK in Okinawa. The transmitter was homebrewed, using a 6L6 tube in the final, and the receiver was an Echophone model EC1A.

Trying to improve his rig, Taima changed a few items during his first year. He moved to an 807 tube in the final and a National NC2-40D for a receiver. Talma was not happy yet. Little by little he wired a linear amplifier with two 4-250A tubes excited by an Italian Geloso G-209. . . and serious TVI resulted. Then he bought a Heathkit DX-100 transmitter with a National NC-300 receiver.

It was in the early days of SSB and only a few stations were heard on the bands. There were only four in Brazil, and Talma was one of them. First with a Hasemaster II with a Band Hopper vfo, and finally, in 1960, with the Collins S-Line, KWS-1 and 75A4.

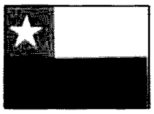
Talma PY4OD.

The same time, the short three-element yagi gave way to a Telrex Monarch six-element beam. Contests became less difficult for him.

Talma was the world winner in the following contests: *CO* WW CW in 1962, 1964, and 1977; *CQ* WW Phone in 1969; *CQ* WW WPX CW in 1979; and ITU Phone/CW in 1978.

As a complete DXer, Talma also has the DXCC Award with 351 countries in the mixed mode, 301 in phone, and 250 in CW. He is an Honor Roll member of the WPX (mixed, CW, and phone) and now is working slowly to the 5BDXCC and 5BWAZ.

Talma says that the best experience he has is while in a contest pileup when an old friend calls him just to wish him good luck. That is his small WORLD!



CHILE

Patricio Fernandez H. CE3GN
PO Box 14781
Santiago
Chile

DXING AGAIN—IN RTTY

All of us know well that amateur radio offers the individual many different fields of activity. As in my case, thousands of hams love DXing and dedicate most of their time to it. A problem arises, however, when one has reached a certain level of countries worked and suddenly the going is getting rough. One is just plain stuck, with practically no hope of working a new one because of poor conditions, or, simply, because after the 300-worked level, it is next to impossible to log more than one or two countries per year at the most.

This happened to me a few years ago, and I was pretty demoralized by the fact that I had lost interest in the hobby; I had lost the joy of continuous DXing. If I were to reach the Honor Roll, at the rate I was going I'd have to wait for at least six or seven years.

After some weeks of thinking about it, I suddenly realized that the solution was simple and easy. Why not start all over again with DXCC, but this time in RTTY?

I bought a simple Tono Theta 7000E, and after a few sessions with it felt as comfortable as in SSB—and there I was, again chasing DX as in the good old days. I had forgotten the exquisite happiness of working easy new ones such as CP, LU, CX, etc.—but now in RTTY.

A few months later, I discussed the subject with my good friend and enthusiastic DXer, Enrique CE3BBW, who was experiencing the same frustration I had gone through, and quickly convinced him to get into RTTY. Today we both hold RTTY DXCC. We are always in touch via 2 meters, passing on information about new ones heard that are needed.

In my case, and I am sure Enrique feels the same way, I have regained interest in the hobby, while keeping up with the activity I like the most, DXing. Perhaps this article can inspire a ham who might be just about to dump his rig into the garbage can.

Granted, it is not easy for a DXer whose mother tongue is not English to type in a foreign language, but after some experience one realizes that one can do well with a few, pre-learned sentences. Also, RTTYers are considerably fewer in number than phone DXers, so competition in pileups is less. One finds sportsmanship, fair play, and good manners, too; breakers are practically unknown. All in all, it is a wonderful experience.

By the way, if you need a CE on RTTY, CE3BBW and I are usually fiddling around with the keyboard on 20 meters after 0000 UTC.

CZECHOSLOVAKIA

Rudolf Karaba (OK3KFO ARC)
Gogol'ova 1882
955 01 Topol'cany
Czechoslovakia

Winners. Nearly a year ago OK3LQ succeeded in contacting EI5FK via aurora, for a distance of 1948 km—a new Czechoslovak record by means of this kind of propagation on the 2-meter band, breaking the 1982 OL7BDQ record of 1811 km with GI8YDZ. Radioclub OK2KZR/P made a new Czechoslovak record with station SM7GEP (904 km); OK2BFH also worked this station, but at 902 km.

Every first weekend in July the Czechoslovak amateur radio organization holds a Field Day for Europe. The 1986 contest results are (winner and score, 2nd and 3rd place stations):

• 144 MHz (Input 5 W)—OK3KFF/P 91,591; HG6V/8, OK3KAP/P
• 433 MHz (Input 5 W)—OK3CDR/P 28,789; OK1KEI, OK1KQT/P

Input according to license class:

• 144 MHz—OK1KTL/P 209,866; OK1KRG/P, OK1KIR/P
• 433 MHz—PAØPLY/A 71,428; OK1KIR/P, OK1DIG/P
• 1296 MHz—PAØPLY 29,225; OK1KIR/P, OK1KEI/P
• 2320 MHz—PAØPLY 3,890; OK1KIR/P, OK1KKD/P

The 1985 OKDX Contest results were (winner and score, 2nd and 3rd place stations):

• Single op, all band—LZ2WF 225,180; RB5IM, UA1DZ
• Single op, 1.8 MHz—DL1YD 6,578; UQ2PQ, DL7MAE
• Single op, 3.5 MHz—UP2BOA 11,415; HA6OA, Y27IO
• Single op, 7 MHz—LZ2BE 27,559; HA1XR, OK3LL
• Single op, 14 MHz—OK6DX 35,685; UA4RZ, I2VXJ
• Single op, 21 MHz—UAØSAU 9,177; LZ1NG, UJ8JA
• Single op, 28 MHz—IK2CLB 126; OK3YX, YO6DDF
• Multi-op, all band—UB3IWA 257,796; UP1BWW, OK5W
• SWL—OK1-11861 52,080; OK1-1957, UA6-150767

RTTY. Mirek OK1AWC made these rare contacts on the 14-MHz band recently: TR8DX, WA9PCI/9Q5, TI2PI, OE3HGB/YK, 5NØALH, PZ1DX, A4XRS (Box 981, Muscat), AM8ORM (Box 162, Santa Cruz de la Palma), 9H1EY/A, and SV5TS (Box 251, Rhodos Island). In the 1985 SARTG RTTY Contest, OK1OAZ (radio club) placed third in the world in the category of collective stations, with 58,000 points for 98 contacts. In SWL, OK1-30342 placed fifth in the world with 7,300 points.

DX. Peter SP7EWL works from Cameroon as TJ1AF and asks that QSLs be sent to his home callsign. Last February, the members of the Soviet polar expedition (sponsored by the magazine *Komsomolskaja Pravda*) were broadcasting as 4KØCOC. They were sailing on an iceberg. QSL via UA3AOC.

INDONESIA

Erlangga Suryadarma
YBØBZZ/V85BZ
ORARI National QSL Bureau
PO Box 96
Jakarta 10002
Indonesia

This concludes the overview report on Indonesia, parts 1, 2, and

Call Area	Suffixes	Province
1	AB–YZ, BAA–YZZ	West Java
2	AB–TZ, BAA–TZZ	Central Java
2	UA–YZ, UAA–YZZ	Yogyakarta
3	AB–YZ, BAA–YZZ	East Java
4	AB–EZ, BAA–EZZ	Jambi
4	FA–LZ, FAA–LZZ	South Sumatra
4	MA–RZ, MAA–RZZ	Bengkulu
4	SY–YZ, SYY–YZZ	Lampung
5	AB–MZ, BAA–MZZ	West Sumatra
5	NA–YZ, NAA–YZZ	Riau
6	AB–GZ, BAA–GZZ	Aceh
6	HA–YZ, HAA–GZZ	North Sumatra
7	AB–GZ, BAA–GZZ	West Kalimantan
7	HA–NZ, HAA–NZZ	South Kalimantan
7	OA–TZ, OAA–TZZ	Central Kalimantan
7	UA–YZ, UAA–YZZ	East Kalimantan
8	AB–JZ, BAA–JZZ	South Sulawesi
8	KA–MZ, KAA–MZZ	Southeast Sulawesi
8	NA–PZ, NAA–PZZ	Central Sulawesi
8	QA–UZ, QAA–UZZ	North Sulawesi
8	VA–YZ, VAA–YZZ	Maluku
9	AB–FZ, BAA–FZZ	Bali
9	LA–QZ, LAA–QZZ	West Nusa Tenggara
9	RA–UZ, RAA-UZZ	East Nusa Tenggara
9	VA–YZ, VAA–YZZ	Irian Jaya
Ø	AB–YZ, BAA–YZZ	Jakarta Raya
1–Ø	A–Z, AAA–ZZZ	ORARI HQ

Table 1. Indonesian callsign breakdown by province.

3 of which were in the August, September, and November issues of 1986.

Frequency Allocation and Band Plan. The frequency allocation for amateurs in Indonesia was adopted from the WARC Final Act, Geneva, 1979, and imposed under the Directorate General of Post and Telecommunications Regulation No. 39/1981. The 10-MHz band was approved for operation in 1982; the 18-MHz and 24-MHz bands were approved for utilization in 1984 on test basis only, and based on results full operation will be effective starting in 1989. In view of the IARU Region III Association sixth conference, ORARI [Organisasi Amatir Radio Indonesia] has proposed the adoption of the three new bands as follows:

10.100–10.150	CW/RTTY
18.068–18.110	CW
18.100–18.110	RTTY
18.110–18.168	Phone
24.890–24.990	CW
24.920–29.930	RTTY
24.930–24.990	Phone

ORARI Awards Program. (As of 11/85) Available to licensed amateurs the world over, for stations worked or heard: the Jakarta Award (JA/SWL-JA), the Worked All Indonesia Award (WAIA/SWL-WAIA), and the Worked The Equator Award (WTEA/SWL-WTEA). General rules:

"ORARI awards will be issued to licensed amateurs for 2-way SSB, 2-way CW, or 2-way RTTY contact, mixed or single mode, mixed or single band, on 80, 40, 20, 15, and 10 meters only. SWL awards in the same category will also be available. The applicant may request endorsement for such distinction accordingly. To be valid, all contact or listening must have been made on or after July 9, 1968. Claim must be accompanied by a QSL card list (GCR) furnished with the callsigns of stations worked, dates, bands, and modes meeting [award requirements]. QSL card list must be accompanied by a statement from the applicant's national society, club station, or from any two amateurs other than the applicant, that the QSL cards of the contacts listed are in the possession of the applicant, and that the items of the cards are correctly listed. A fee of US $8 or 16 IRCs will be charged per award and should be sent along with the application to the respective awards manager (personal checks not acceptable). Only contact with land stations will be acceptable."

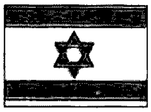
JA. DX stations need contacts with 20 stations, including at least one club station, in the Ø call area. (Indonesia stations need 50 contacts including at least five club stations.) Club stations are: YBØ–ZAA, ZAB, ZAD, ZAE, ZAF, ZBA, ZBB, ZCA, ZCB, ZCD, ZCE, ZDB, ZDC, ZDD, ZDE, ZDG, ZEA, ZEE, and ZZ. Awards Manager: Mr. M. S. Lumban Gaol YBØWR, PO Box 96, Jakarta 10002, Indonesia.

WAIA. DX stations need contacts with two stations in each call area (1 to Ø, see Table 1) for a total of 20—except *CQ* Zone 28 stations need three each for a total of 30. (Indonesian stations need five from each. QSL card list must include YB, YC, and YD stations in each call area.) Awards Manager: Mr. M. Maruto YBØTK, PO Box 96, Jakarta 10002, Indonesia.

The Israel Amateur Radio Club honorary president, 4X4AH, opens the 1986 IARC Annual Assembly. L to R: Rami 4Z4LX, Mr. Bar Sela and Mr. Klepner of the Ministry of Communications, Yankele 4X4AH, Evan 4Z4MO, Aharon 4X4AT, and Yosef 4X6KJ (photo by 4Z4MK).

WTEA. Issued for contacts with ARRL DXCC countries along the equator: C2, HC, HC8, HK, KH1 and KB6, PP–PY, PYØ (St. Peter), S9 (Sao Tome), T3Ø, T31, T32, TN, TR, YB5, YB7, YB8, 5X, 5Z, 6O, 8Q, and 9Q. Issued in three classes: I for 15 countries, II for 12, and III for 8; in all classes, contacts with YB5, YB7, and YB8 are obligatory. Awards Manager: Mr. Ben S. Samsu YBØEBS, PO Box 96, Jakarta 10002, Indonesia.

1987 Contest Calendar. *1987 information had not arrived by press time, but two fixed-date contests are ORARI Anniversary, July 6–8, and Indonesia Independence Day, August 17–18.*



ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev M.P.O. 85530
Israel

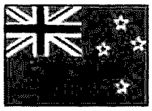
Update on Israeli repeaters: All amateurs visiting Israel are invited to use them and get to know the locals. On two meters, all are with input 600 kHz below the printed output frequency, and on UHF the input is 7.6 MHz down. All are straight carrier access—no special tones are required.

Beersheba	145.325
Eilat	145.675
Haifa/Northern Coastal Strip	
	145.675
(RTTY Mailbox)	145.300
	438.800
Jerusalem	145.625
Safed/Galilee	145.350
Tel-Aviv	145.775
	438.650

You can also hear many QSOs on the simplex channels which are generally to be found from 144.500 up. Being in IARU Region One, we stick to the standard band plan as much as possible, two meters being from 144 to 146 MHz.

Restructuring of callsigns: With the growth of the amateur population, the authorities have decided to make the callsign indicative of the class of license. Novices, who are limited to CW QRP on 40 and 15 meters, will be using calls from the 4Z9AAA–4Z9ZZZ block. Grade B amateurs, with full frequency privileges but limited to

150 Walts output, will retain their present 4X4, 4Z4, and 4X6 calls with the two-letter suffix. Grade A people, who can run up to 1.5 kW out, will be granted the 4X1 prefix while retaining their old call letters. These new regulations should be in effect by the time you read this, so rejoice, all prefix collectors!



NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

In April of 1984, the New Zealand Post Office proposed to all ZL amateurs an outline of a new structure for the Amateur Service. The result has been changes in the 1970 Radio Regulations as follows.

There now are only three grades of Amateur Operators Certificates: Novice, Limited, and General, with the first now being permanent instead of annual. The second replaces, unchanged, the old Grade III (non-Morse). The General replaces the old Grades II and I. Entry to the Service may be made at any level; Novice and Limited may be held simultaneously.

Novice privileges: 3.525–3.575 and 28.19–28.60 MHz, 10 W rf output maximum, 30 W PEP. Limited: 51.00 MHz to 400 GHz, all bands, all modes, 120 W output or 400 W PEP. General: for the first 12 months, restricted to 1800–1950 kHz, 3.5–3.9 MHz, and 28.00–29.70 MHz, and all bands above 50.0 MHz; thereafter, all New Zealand amateur bands. Maximum 120 W mean power output or 400 W PEP.

All existing Grade II ops who were restricted for the 12 months listed are now entitled to full privileges, so considerable increase in ZL HF band activities is expected—a thousand or so ZLs are involved.

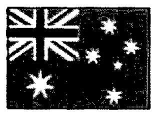
Maintenance of a station log is now at the discretion of the licensee, but ZLs are reminded that there can be occasions when the existence of a log can be a useful safeguard.

PROJECT DL

In August of 1985, three NZART members, Terry Carrell ZL3QL, Ian Ashley ZL1AOX, and John Philpott ZL3THJ, escorted a computer from New Zealand via London to Marburg, Germany, for AMSAT-DL. Although the major costs were met by AMSAT-DL, NZART helped cover the cost of the terminal and incidental expenses. This all came about because Dr. Karl Meinzer DJ4ZC was impressed by the sophistication of much of the equipment he saw in daily shack use when he was here for the NZART Conference.

At ZL2JW's he noticed a DEC-Digital LST-11/23 minicomputer and discovered that it was what he needed for fast number crunching—it was equipment of a class not readily available in the second-hand market in Germany. Ham "connections" connected, and within a couple of days a suitable unit was located and the details of equipment, price, and delivery were confirmed. These included installation by ZL3THJ and the assistance of ZL3QL and ZL1AOX (who paid for their own travel) in coordinating equipment use between DL and ZL.

Thanks to John Philpott's preparatory work, the computer was fired up and the software/parameters groundwork done without a hitch. Other than that, there were only some initial headaches integrating Karl's printer into the system. Gratitude also is due John's employers, Business Computers, for their support throughout.



NORFOLK ISLAND

Kirsti Jenkins-Smith VK9NL
PO Box 90
Norfolk Island, 2899
Australia

HONOR TO VK

Norfolk Island was honored to have one of its five operators elected to the *CQ* DX Hall of Fame this year. Jim Smith VK9NS is the first VK ever to have achieved this recognition.

QSLing AND FINANCIAL RUIN

Operating from a place like Norfolk Island automatically throws the new operator onto the DX scene. VK9 *IS* DX, attracting hundreds of callers who need the Island for a new country. If they are chasing DXCC, they will want confirmation of the contact. Operators of the DX stations face financial ruin if they try to meet the expense of cards, envelopes, and postage to all of these callers.

The serious DXer is aware of the problems and includes return postage and a self-addressed envelope with his QSL. Others QSL via the bureau. Bureau cards soon amount to thousands, exceeding both time and money available for "free" QSLing. In addition, Norfolk Islanders cannot just hop on the plane and travel 900 miles to the mainland to pick up their bureau cards. They, therefore, are obliged to pay postage—for cards received as well as for outgoing cards—to the VK division handling VK9 cards. VK9 is composed of Norfolk Island, Lord Howe Island, Willis Island and Mellish Reef (uninhabited), Cocos Keeling, and Christmas Islands.

There is no such thing as a VK9 bureau. The islands do *not* form a cozy little group where we can jump into our canoes and paddle through balmy waters to a central QSL bureau! The surest way to get a QSL card is by direct QSLing, including SAE and postage. If you have heard warnings about DX stations pocketing postage money and not QSLing, well there are such people in the world, but would such a person be likely to QSL through a bureau in any case?

GOOD NEWS

Our AM broadcasting station is operating again. The transmitter went to the U.S. for repairs, but when it arrived back it was found to have been damaged in transit. It then had to go to the mainland for further repair. Anyway, it may now be heard on 1566 kHz (VL2NI) from 1930 UTC through 1130 UTC the following day. (That's 0700–2300 local time.)

And the VK9NS/VK9NL shack is rarin' to go after repairs. A cow chewed and swallowed one of the phasing lines on the 40m array in the paddock, the tribander received storm damage, and the whole length of coax from beam to shack had to be replaced—apparently those nice birds we like listening to in the mornings liked to peck holes in it. VK9NS is working 160 and 80 almost daily from about 0630 UTC (our sunset) and about 1000 UTC, following the sunrise across the U.S. The hours will, of course, change with the seasons, but anyone with a DX edge can work out our sunset and his own sunrise.

LOOKING WEST

Number 19 on your Feedback card

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

THE NEW ELECTRONIC COMMUNICATIONS PRIVACY ACT

The hotly debated Electronic Communications Privacy Act of 1985 became an act of 1986 before it finally became law. In early October of 1986, the ECPA passed both houses of Congress. The radio protection provisions of the new law will go into effect in mid-January, 1987, about the time you read this column. The final draft of the bill was printed in the October 1, 1986, issue of the *Congressional Record*, starting on page S-14441.

Throughout the proceedings, a number of personal radio groups were active in fighting against the most restrictive aspects of the bill. At one point, provisions were about to be included that would have forced the communications privacy statutes to cover even ham radio phonepatch and autopatch. There was also a fairly well-founded rumor that certain business interests, eyeing the amateur VHF and UHF spectrum, were attempting to get provisions added that would ban any "ciphered" amateur communications.

What was meant by ciphered communications? That's hard to say. Many think that it would have meant an end to packet, AMTOR, and possibly even CW! But we can forget all of this. For the most part radio amateurs fared pretty well with regard to their own service, but with regard to other communications hams now fall into the category of the general public.

And, it is really the general public that the radio communications aspects of the ECPA can hurt the most. The radio hobbyist who wants to listen to everything coming into his home is no longer free to do so. In fact, John Q. Public does not know it yet, but if he turns a radio to the wrong frequency—even by accident—he technically becomes a criminal. It's doubtful that he will ever pay a fine or go to jail, but that threat now looms over everyone's head.

One of the best-versed people on the subject of the ECPA is Robert Horvitz, the Washington DC based government affairs liaison officer for the Association of North American Radio Clubs. Robert is with ANARC's political arm, representing the interests of SWLs and other radio-monitoring hobbyists. He is also a very intuitive individual and an excellent analyst of matters such as these. What follows is his "preliminary analysis of the Electronic Communications Privacy Act of 1986." Read it carefully, as it affects you.

The New Law

The ECPA amends the U.S. code title 18, chapter 119, the federal law governing the interception of "wire" and "oral" communications, to protect a new legal category of "electronic communication." It sets new rules for electronic surveillance by law enforcement agencies, and for investigative access to electronic mail and computer files. It also increases criminal penalties for malicious interference with satellite transmissions.

> ***"Taken literally, the new law makes listening to FM stereo broadcasts and the audio portion of television broadcasts a federal crime."***

Electronic communication is defined as "signs, signals, writing, images, sounds, data, or intelligence of any nature transmitted in whole or in part by a wire, radio, electromagnetic, photoelectronic, or photo-optical system that affects interstate or foreign commerce, but does not include a) the radio portion of a cordless telephone communication, b) any wire or oral communication, c) any communication made through a tone-only paging device, or d) any communication from a tracking device."

Radio and wire transmissions are thus merged in this new term. However, the new law also retains and adapts the earlier legal definition of wire communication as a category separate from electronic communication. Wire communication now means voice telephony, regardless of whether the transmission is by wire, radio, or other electronic means. In other words, non-voice communications by wire are considered "electronic" communications, as are communications by radio that do not involve telephone transmission.

Unauthorized interception of the radio portion of a wire or electronic communication carries lesser penalties than does interception of the wire segment of the same communication—if it's not for an illegal, commercial, or tortious purpose. See the "Penalties" section below for details.

What May Be Legally Monitored

1) Any marine or aeronautical radio communication.

2) Any amateur, CB, or general mobile radio service transmission.

3) Any communication transmitted "for the use of the general public, or that relates to ships, aircraft, vehicles, or persons in distress."

4) The radio portion of cordless telephone communications linking the handset and the base unit.

5) Tone-only paging signals.

6) Certain types of audio subcarriers (to be specified in a Senate report).

7) Signals causing harmful interference to "any lawfully operating station or consumer electronic equipment to the extent necessary to identify the source of the interference."

8) Satellite transmissions of "network feeds," some satellite audio subcarriers, and cable-destined programming covered by section 705Z(b) of the Communications Act.

9) Any governmental, law enforcement, civil defense, private land mobile, or public safety (including police and fire) radio communications system that is "readily accessible to the general public."

10) Any other electronic communication made through a system "configured so that such electronic communication is readily accessible to the general public."

In most cases, radio communications defined as not "readily accessible" will be legal to monitor, unless one of the foregoing exemptions applies. "Readily accessible to the general public" is defined to mean that the communication is not:

1) Scrambled or encrypted.

2) "Transmitted using modulation techniques whose essential parameters have been withheld from the public with the intention of preserving the privacy of such communication." (The House report says that this means and includes spread-spectrum signals.)

3) "Carried on a subcarrier or other signal subsidiary to a radio transmission."

4) "Transmitted over a communication system provided by a common carrier" (except for tone-only paging signals).

5) Transmitted on frequencies allocated under FCC rules Part 25 (communication-relay satellites), Part 74(d) (remote broadcast pickup stations), Part 74(e) (aural broadcast auxiliaries, including studio-to-transmitter links), Part 74(f) (television broadcast auxiliaries and studio-to-transmitter links), or Part 94 (private fixed microwave).

As mentioned above, there are some exceptions to the general ban of allegedly "inaccessible" signals. For example, the radio emission of a cordless phone may be monitored, even though it relays common carrier communications. Similarly, marine and aeronautical radiotelephone signals are legal to monitor. (In contrast, phone patches in the 800-MHz specialized mobile radio service are legally protected, since the phrase "readily accessible" qualifies the exception for private land mobile radio, which includes SMRs.)

The forthcoming Senate report on the ECPA is expected to identify the types of audio subcarriers that may legally be monitored, even though the new law declares that all subcarriers are inaccessible. (Taken literally, that makes listening to FM stereo broadcasts and the audio portion of television broadcasts a federal crime.)

Although broadcast remote pickup (RPU) stations authorized under FCC Part 74(d) are declared to be "inaccessible," they operate near 26, 153, 161, 166, 170, 450, and 455 MHz, usually with citywide audio coverage.

Used by broadcasters to coordinate the coverage of events outside the studio, RPUs can be received on most scanners. They are a favorite among scanner owners because of their newsgathering role. As the result of an amendment to the ECPA introduced by Senator Paul Simon at ANARC's request, the ECPA creates no criminal liability for monitoring RPUs when monitoring is for no bad purpose. (The following section supplies information about civil liabilities.)

Penalties

For most unencrypted radio communications protected under the ECPA, intentional unauthorized interception carries a criminal penalty of up to one year in jail and/or a fine of up to $100,000 for a first offense that is not for a bad purpose—i.e., "not for a tortious or illegal purpose or for purposes of direct or indirect commercial advantage or private commercial gain."

If it is a "private land mobile radio service" communication (i.e., a cellular or a traditional IMTS radiotelephone call) or any type of paging except for tone-only, and if the signal is not scrambled or encrypted, and if the interception is intentional but not for a bad purpose, the penalty for a first offense is a fine of up to $500.

If the communication is scrambled or encrypted or if the interception is for bad purposes or is a second or subsequent offense, the penalty is up to five years in jail and/or a fine of up to $100,000.

Intentional interception of an unencrypted Part 74(d) transmission, without bad intent, carries no criminal penalties. However, the federal government may seek a court injunction against a specific interceptor and assess civil damages of up to $500. Any violation of the injunction carries with it a mandatory $500 civil fine, liability for any actual damage suffered by the plaintiff, or statutory damages of up to $1,000.

Any criminal violation of the ECPA exposes the interceptor to civil liabilities (risk of a lawsuit). For any violation other than those described in the last paragraph, courts may reclaim any profits made from or damages caused by the interception, or assess statutory damages of $100 for each day of violation, or impose a fine of $10,000, whatever is greatest.

Intentional Versus Inadvertent

The ECPA makes it a federal crime to intentionally intercept, disclose, or use electronic communications protected under this act. Even "endeavors to intercept" are a crime [section 2511(1)(a)]—even if you do not succeed! Under the ECPA, acting on the intention is sufficient to constitute a crime.

Obviously, the exact legal meaning of "intentional" and the kind of proof required to establish intent in court are crucial. The House report says that intentional means that acquiring the contents of an electronic communication is one's "conscious objective." According to this House report, requiring intent "precludes the application of civil or criminal liability for acts of inadvertent interception."

However, the report adds: "The term 'intentional' does not require that the act was committed for a particular purpose or motive." The ECPA thus does not criminate the act so much as the "state of mind" or attitude relating to the act. Interception achieved by accident is not a crime.

"It's ironic that the thanks for our salvation must go primarily to a non-ham group."

Unfortunately, this distinction is rather murky in the case of recreational scanning with a multi-band radio receiver. Does casual browsing constitute intentional or inadvertent interception? What about automatic band-searching? And, what constitutes proof of intent—the possession of a frequency list? We hope for answers in the upcoming Senate report. In any event, requiring proof of intent should limit a hobbyist's chances of being successfully prosecuted for recreational monitoring that causes no detectable harm to those whose radio communications were tuned in.

Surreptitious Interception Devices

An easy way to enforce the ECPA would be to criminate ownership of devices capable of receiving protected communications. In fact, the ECPA amends sections 2512 and 2513 of the U.S. code title 18 in an attempt to do just that. When the new law goes into effect, it will become illegal to manufacture, assemble, possess, sell, advertise, or send through the mail any electronic device whose design "renders it primarily useful for the purpose of surreptitious interception of wire, oral, or electronic communications."

Due to imprecise drafting, the ECPA's ban on "surreptitious interception devices" does not distinguish between electronic communications that are legal to receive and those that are illegal. Depending on how the word "surreptitious" is defined, an AM-FM broadcast receiver concealed in a stuffed animal could qualify as an illegal device; similarly, a microcomputer with a modem and built-in code-breaking software might also constitute an illegal device, depending on how the word "primarily" is defined. We can only hope that the Senate report defines surreptitious interception devices in a way that is both clear and narrow. We also hope for insight into the legal status of subcarrier tuners, voice inverters (simple descramblers), teletext readers, radioteletype terminals with bit-code translation features, and programmable scanners.

A Final Look

I think that what Robert Horvitz has written requires little explanation by me. Therefore, I will not dwell on the effect that the ECPA has on the general public. But as radio amateurs concerned with the very narrow realm of our own Part 97, U.S. amateur service, we are totally unscathed by the ECPA.

The forces that hoped to "quietly" clobber radio amateurs through this new law not only backed away because of all of the negative publicity that our ranks generated, but now deny that they ever intended us any harm. To them I have only these few words: "You declared yourselves to be our enemies when you started this farce, and there is no reason to think that corporate 'leopards' will ever change their spots."

They envy what we have, and when it comes to spectrum, what we have is worth hundreds of billions of dollars in corporate profits if reallocated to potentially paying users. I suspect that, given the chance, they would pounce on us and damage or destroy our service's viability so as to eventually gain access to the very lucrative spectrum we now possess.

It's ironic that the thanks for our salvation must go primarily to a non-ham group. It was an SWL organization called the Association of North American Radio Clubs that readied up the very best opposition of all. It was the only radio hobbyist group that had full-time personnel in Washington DC following the ECPA from the day of its inception until it cleared Congress. It was the one group that really made a difference. Of special note is the work on this matter done by ANARC's outgoing executive secretary Richard T. "Terry" Colgan WD5GWC. Terry and his crew lead a valiant battle to preserve the rights of all radio hobbyists—ham and non-ham alike. While other organizations such as the Scanner Association of North America, several CB groups, almost all of the Ham Radio Press, and finally even the ARRL provided some measure of support, in reality it was ANARC that stood at the head of the pack. To that end, ANARC, we salute you.

ECPA Postscript: Help Wanted

The following appeared in the want-ads employment section of the *Washington Post* shortly after the Electronic Communications Privacy Act of 1986 was signed into law:

"PUBLIC RELATIONS MANAGER FOR TELECOMMUNICATIONS ASSOCIATION.

A leading national trade association headquartered in Washington DC is seeking an experienced Public Relations Manager. The person will be responsible for generating media coverage of the Mobile Communications industry; providing comprehensive information to members as well as the general public, and promoting the association and its position to the membership and the industry at large. Respond to Box M-6723, *Washington Post*, 1150 15th Street NW, Washington DC 20071."

Question: Could this be some early fallout from the inability of at least one of the communications lobbyists to get what his employer wanted included in the ECPA?■

PROPAGATION

Number 23 on your Feedback card

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA	20	40	40	40	80	80				20	15	15
AUSTRALIA	20		20		40	40	20	20			15[1]	15[1]
CANAL ZONE	15	20	20	40	40		20	20	15	15	15*	15*
ENGLAND	20	40	80	40	40		20	20	20	20	20	20
HAWAII	20		20		40	40	80	20			15[1]	15[1]
INDIA	[illegible]					20[1]	40[1]	20[1]				15[1]
JAPAN	20						20	20				20
MEXICO	15	20	20	40	40		20	20	15	15	15*	15*
PHILIPPINES							20					
PUERTO RICO	15	20	20	40	40		20	20	15	15	15*	15*
SOUTH AFRICA			40[1]	40[1]				15	15	15	20	20
U.S.S.R.	40	80	80	40			20	20	20			40
WEST COAST		80	80	40	40	40	20	20	20			

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA						80*	40*	20				
ARGENTINA	20		40	40	40						15	15
AUSTRALIA	15					40	20	20	20			15
CANAL ZONE	20	80	40	40	40	40	20	20	15	15	15	20
ENGLAND	40	40	40	80				20	15	20		40
HAWAII	15	20			40	40	40				15	15
INDIA	15[1]	20[1]	20[1]				40[1]	20[1]	20[1]			
JAPAN						80*	40*	20				
MEXICO	20	80	40	40	40	40	20	20	15	15	15	20
PHILIPPINES								20				
PUERTO RICO	20	80	40	40	40	40	20	20	15	15	15	20
SOUTH AFRICA	20	40*							15	15	20	20
U.S.S.R.	40		40	40				20	20			

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20			40	40	40	40	40			20
ARGENTINA	15	20		40	40	40	40	40		15	15	15
AUSTRALIA	15	20	20				40	80*	40	15	15	15
CANAL ZONE	20	20		40	40	40			20	15	15	15
ENGLAND			80*	40					20	20		
HAWAII	15	15			20	20	20	20				15
INDIA		20										
JAPAN	15	20			40	40	40	40	40			20
MEXICO	20	20		40	40	40			20	15	15	15
PHILIPPINES	15	20					40	40		20		20
PUERTO RICO	20	20		40	40	40			20	15	15	15
SOUTH AFRICA	20	40[1]	40[1]							15	15	20
U.S.S.R.		40[1]	40[1]	40[1]	40[1]				20	20		
EAST COAST		80	80	40	40	40	20	20	20			

1 = May be open only once or twice during month.
*** = Try next higher band.**

G = Good, F = Fair, P = Poor.

JANUARY

SUN	MON	TUE	WED	THU	FRI	SAT
				1 F-P	2 P	3 P-F
4 F-G	5 G	6 G-F	7 P	8 P	9 P-F	10 F
11 F	12 F-G	13 G	14 G	15 G	16 G-F	17 F
18 F-P	19 P	20 P	21 P-F	22 F	23 F-G	24 G
25 G-F	26 F	27 F	28 F-P	29 P	30 P-F	31 F-G

FEB. 1987 Issue #317

73 Amateur Radio

USA $2.95
CAN $3.95
A WGE Publication

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NEVER SAY DIE

Number 20 on your Feedback card

A VERY BAD IDEA?

Just as the news of gold brought hundreds of thousands of Americans to California a hundred years ago, we're seeing a feeding frenzy of greed gathering behind the idea of selling off lesser needed ham frequencies and splitting the money among the few of us amateurs who are still left.

To get a handle on the actual value of our ham bands, you should know that the Metromedia cellular license is up for sale for $1.2 billion. The value of a radio channel has to do with how much income can be derived from it. My calculator doesn't have enough digits to work out the value of a TV channel—which can be sold in 50 to 100 markets, each one worth billions.

Let's see, if we sold off one of our ham bands, say the 420–450-MHz band, and we only got $10 million per channel instead of $1 billion—figuring 20 kHz per channel and thus 50 channels per MHz—we'd have about 1,500 channels to sell, times at least 50 markets, a total of 75,000 channels. Heck, if we marked 'em down to $10 million per channel for a quick sale, we'd have $750,000,000,000 to split up.

The FCC says there are about 420,000 of us. However, the latest *73* subscription mailing brought back a 12.5% return marked "deceased." That brings the number of live amateurs down to around 360,000. Further, I see no reason why we should even think of splitting the pot with hams who are so little interested in the hobby that they aren't active—which brings us down to more like 175,000. This would net about $4.3 million each. Now the question is, would you swap our wonderful 450-MHz band for a lousy one-time $4.3 million for yourself? Not darned likely, right? Heck, after taxes you'd only have about $2.7 million at the new 38% tax rate. If you're able to invest this for a return of 8% per year, you'd have $216,000 which after taxes would be more like $134,000—which isn't as much as it sounds. Piddling.

With decent houses going in the millions, even rather ordinary yachts over a million, and many cars in the $125,000 range, you'd have to watch your expenses carefully just to get by. You might even want to settle for a Taiwan-made Rolex instead of a Swiss.

But, I argue, this is ridiculous—here we're talking of selling a priceless heritage. Well sure, they say, but since we aren't bothering to keep the hobby alive by attracting youngsters, we're going to lose it anyway when the last few amateurs die off in a few years. So why not get what we can for it now and take up some other hobby? If we sold off even one ham band, every ham could retire today and live off the income from investments. Live frugally perhaps, but live. Imagine what we could make by selling all of 'em!

One bunch of contentious old-timers has been arguing that the proceeds of selling our ham bands shouldn't really be split evenly, but should be apportioned on the basis of seniority. For instance, I've been at it for 48 years, so I would get 48 shares of the pot. A new Novice might get one share. I don't know just why, but this proposition has a subtly attractive aspect.

If we're going to divvy things up on that sort of basis, perhaps we should provide extra credits for hams who were active during the years when amateur radio was benefitting the world—back before the Incentive Licensing proposal brought the hobby to a complete halt in 1964. Perhaps double points for years before 1964 would even things a bit. This would give me 76 shares instead

Continued on page 10

QRM

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Circulation Offices
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Subscription Information

Rates: in the United States and Possessions: One Year (12 issues) $24.97; Two Years (24 issues) $45.47. Elsewhere: Canada and Mexico—$39.00/1 year only, US funds. Foreign surface mail—$45.00/1 year only, US funds drawn on US bank. Foreign air mail—please inquire. To subscribe, renew or change an address: Write to Subscription Department, PO Box 931, Farmingdale NY 11737. Return postage guaranteed. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients. For questions concerning your subscription and to place subscription orders, please call us toll free at 1-800-227-1053 (in NY 1-800-732-9119) between 9 am and 4:30 pm Eastern time or write to *73*, Subscription Department, PO Box 931, Farmingdale NY 11737. ***73 Amateur Radio*** (ISSN 0745-080X) is published monthly by WGE Publishing, WGE Center, Peterborough NH 03458-1194. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Canadian second class mail registration number 9566.

Microfilm Edition—University Microfilm, Ann Arbor MI 48106. **Postmaster:** Send address changes to *73 Amateur Radio*, Subscription Services, PO Box 931, Farmingdale NY 11737. Nationally distributed by International Circulation Distributors. **Contract:** What kind of dummy wastes time reading the fine print of the postal statement? Wayne, Perry, and the others write their poor hearts out for you and here you are instead reading this bunk. What further proof is needed that hams are crazy? Case closed.

QRX . . .

EDITED BY PERRY DONHAM KW1Q

Jammin'

ACCORDING TO A STORY in *Sweden Calling DXers*, the Soviet Union has stopped jamming Russian-language broadcasts from China's **Radio Beijing**. Sino-Soviet relations have been warming up lately, and this seems an attempt to prove to the Chinese that the USSR is playing according to the rules. The Russians have also recently stopped jamming transmissions coming from Albania and South Korea. Although not considered a jamming transmitter, the Soviet over-the-horizon radar (affectionately known as the Woodpecker) continues to operate up and down the HF bands. It looks as though the U.S. will have as many as three OTHR systems running in the near future; government experts claim that interference to radio services in the 3–30-MHz range will be "minimal."

Video Nouveau

THE AMERICAN RADIO RELAY LEAGUE'S latest promotional video has begun production. The thirty-minute show, tentatively titled "The New World of Amateur Radio," depicts the fun and excitement to be found in ham radio, and targets both children and retirees. The production team includes **Forrest "Frosty" Oden N6ENV** and **Bill Pasternak WA6ITF**. **Roy Neal K6DUE** will be featured in the video. The producers are looking for interesting stories to include in "The New World"; if you have suggestions or material, or would like to volunteer a little time to the project, contact Bill Pasternak WA6ITF, 28197 Robin Avenue, Saugus CA 91350.

Lookithat!

SPEAKING OF THE LEAGUE, take a look at page 8 of this issue—you'll find an ad from the ARRL! Believe it or not, Wayne and the folks in Newington have decided that it's time to join forces for the sake of ham radio. We need to speak to the government with one strong voice to get the rules we want and to help save our hobby from sliding down the tubes. Yes, there's an ad for *73* in *QST*, too. Don't worry that Wayne has gone soft—if the ARRL screws up, you can bet that W2NSD will be right on top of it.

Decline

DESPITE THE SUCCESS of the volunteer testing program, the number of hams is still decreasing. The VECs certainly are packing them in, and testing sessions are being held as often as once every two weeks in some areas. But for several months in a row now, the number of hams deleted from the FCC computer has exceeded the number added. Granted, the totals are low—last month we saw a decline of only 70 licensees, but it's not the boom everyone had hoped for with the advent of the VE system. One of the biggest problems we have is that there is no way to count the number of operators in the country. It's only been a few years since the ten-year license was adopted, and a lot of our folks are just dying off. Most of the time the FCC is not notified of a licensee's death, so we end up with a lot of non-breathing people in the computer. Last month I mentioned that a mailing we sent out came back with 12% marked "deceased." *Twelve percent!* That rate is only going to climb as we head further into the ten-year license term. Unless Novice Enhancement works or we get a no-code license established, you can expect a sudden sharp decline in the amateur population when all of those ten-year licenses expire and there's no one alive to renew them.

PIARA

THE INTERNATIONAL COMMUNITY in and around Paris, France, has established the **Paris International Amateur Radio Association** to promote activity among licensed foreign operators in France. If you happen to be in Paris on the fourth Friday of the month, be sure to drop in on the regular club meeting (at 7 p.m.); the rest of us can get a copy of PIARA's newsletter by sending an SASE to Chuck Martin F/AB4Y, CPU A-316, APO NY 09777. Chuck reports that French reciprocal licenses are now being granted while-you-wait in Paris.

RFC

A NEW COMPANY has been formed by V/UHFers **Ken Holladay K6HCP** and **Everett Gracey WA6CBA**. Ken and Everett were the original co-founders of Mirage Communications. Their new company, RF Concepts, will offer products for the V/UHF enthusiast such as an all-mode, 170-Watt VHF amplifier with a built-in GaAsFET preamp and a 30-Watt HT amplifier also with a built-in preamp. You can get in touch with RFC by writing or calling RF Concepts, 2000 Humboldt Street, Reno NV 89509; (702)-827-0133.

This is Colleen Brady KB2BRL of East Aurora NY and her friend Lasagna. Colleen is 10 years old. We don't know how old the dog is.

Coop Clip

WE INADVERTENTLY snubbed Jim Cooper, Jr. KD0OZ when we published the results of *73*'s 160-Meter SSB Championship. Jim had over 500 QSOs and in excess of 100,000 points to capture the top spot in Minnesota and tenth place in the country. Good work, Jim!

G/ACK

REPORTING IN *GATEWAY*, the ARRL's packet newsletter, Jeff Ward G0/K8KA tells of a breakthrough for packet radio in Great Britain. The Radio Society of Great Britain was informed by the Department of Trade and Industry late in November that limited operation of packet stations would be allowed. Specially licensed packet repeater stations, running on 144.650 MHz, are able to store and forward messages, but are prohibited from acting as full-featured bulletin boards (English hams can't download files from the PBBSs). Right now, packet stations are restricted to two meters; late next year UHF allocations will be opened to packet operation. Jeff says that the network is using W0RLI autoforwarding software. Current PBBS-authorized stations are GB3AP, GB3BP, GB3DB, GB3DP, GB3EP, GB3HP, GB3HQ (RSGB HQ), GB3JP, GB3NP, and GB3UP (University of Surrey/UoSAT). If you want to keep up-to-date with packet in Great Britain, you can subscribe to *Connect International*, a new publication distributed by the RSGB. The price for airmail delivery is 9.24 Pounds Sterling; subscriptions run from July 1. Address your request to the Radio Society of Great Britain, Lambda House, Cranborn Road, Potters Bar, Herts. EN6 3JW, United Kingdom (love those English addresses!).

No Retest

THE FCC has decided that automatic retesting is not appropriate in most cases of trouble during a volunteer-administered ham exam. The commission reasoned that the team of volunteer examiners is close enough to the situation to decide whether an application should be processed or not. If someone is caught cheating, the exam papers will be flagged by the VE and no license will be issued. The applicant would be free to try again

at another testing session. The FCC did point out that they still have the authority to require a retest of any ham at any time.

Ham Scam

A VERY OFFICIAL-LOOKING LETTER from what appeared to be a government agency connected with the FCC was shown to us at the Ham West convention in Nevada. The gist of the letter was that the FCC would not renew a ham ticket unless you sent $50 to the license renewal service. The firm is based in Gettysburg, and the language used was very persuasive. Be aware that it does NOT cost anything to renew a ham ticket. Just get a Form 610 from your local ham club or Volunteer Exam Coordinator and mail it in. The license renewal services are in fact legal and usually service the broadcast and land mobile industry where paperwork is much more complicated. Someone apparently heard that hams were gullible.

Insta-Ham

KONRAD EKSTROM WB1GXM has asked the FCC to speed up the process of getting a ham license. Konrad suggests that the commission issue blocks of callsigns to the Volunteer Exam Coordinators, who would in turn issue calls at random to successful applicants. The FCC would still handle the printing and mailing of the official station and operator license. We'll let you know if Gettysburg assigns a number to Konrad's petition.

Vintage Heath

HEATH COMPANY President Bill Johnson recently presented two vintage Heathkit computers to the Smithsonian Institute in Washington DC. The H-8 microcomputer and H-9 terminal will be part of a permanent exhibit called "The Information Revolution." The presentation was held in conjunction with the Capitol Heath User's Group conference where nearly a thousand Heath computer owners gathered to exchange data about their machines.

Cap Tip

AN ERROR in Terry Staudt's "Defuse RFI" article in our November, 1986, issue may have left you wondering why you bothered with a coaxial ground. Please change the capacitors on the ends of the coax to .001 uF.

Classy Rigs

IF YOU HURRY, you can still dust off your vintage gear and have it running in time for this year's **Classic Radio Exchange**. The test will be held from 2100Z Sunday, February 1, to 0400Z Monday, February 2. A classic radio is considered to be any equipment at least ten years old, although you can enter the contest with any rig (you get more points by operating a classic radio). Exchange your name, RST, QTH, and receiver and transmitter model (if it's home-brew, just send the PA tube number). The same station may be worked with different equipment combinations on each band and mode. To calculate your score, multiply your total QSOs by the number of different receivers, transmitters, and states/provinces/countries on each band and mode. Multiply that number by your Classic Multiplier: the total years old of all of the receivers and transmitters you used (you have to make at least three QSOs on each piece of gear). If you have a classic transceiver, multiply its age by two. Certificates and memorabilia are awarded ("every now and then," says sponsor Jim Hanlon W8KGI) for the highest scores, the longest DX, the most exotic equipment, the best excuses, and so on. Send your logs, comments, and pictures to Jim Hanlon, 5560 Linworth Road, Columbus OH 43085. Be sure to include an SASE.

Aloha

THIS MONTH'S COLUMN comes to you with the help of *The W5YI Report, Gateway, Amateur Satellite Report*, and *Westlink*. Don't forget to send your news items to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: QRX.

NEVER SAY DIE

from page 4

of 48, which certainly seems much more equitable and logical.

Should we also recognize the class of license in some way? I've seen some suggestions that Novices and Techs have a one multiplier, Generals a two, and Advanced and Extras a five. Ten seems more reasonable for Advanced, but five is okay. I don't see anything wrong with that. Let's see, that would bring me up to 380 shares. Eminently reasonable, really.

Should there be a bit of extra credit for hams who have made substantial contributions to the hobby—for instance in the way of articles published in our major ham magazines? Several of the more perceptive hams have proposed this—suggesting an additional credit of two and a half shares for every page of writing which has been published. Sure, this would give an extra boost to regular columnists, but then these are the people who have helped make amateur radio exciting over the years, so perhaps it's time for them to get their reward. I like the concept, despite it's seeming to favor me slightly with my 1,437 pages of editorials and articles published over the last 30 years—which would only amount to an extra 3,620 shares, bringing me to 4,000 shares.

Let's see, where are we now? With 175,000 active hams with an average age of 56 years—with most licensed at about 16 years old, that would give them 40 years of hamming. Factoring in license class we have about 70,000 Novices and Techs, 97,000 Generals, and 274,000 Advanced and Extras. The additional shares attributable to being published would add 120,000 more shares. We'd need a computer to work all that out, but I figure I'd end up with around $295 million this way. Not personally being greedy, I don't see anything wrong with this. In fact, how's about checking out another ham band to sell? I know I might have a problem parting with 450 MHz for a personal gain of a lousy $300 million, but once they start talking real money, well... golly, these are things a person has to consider.

Sure, we've got a bunch of 450 repeaters around—most of 'em in Southern California. Maybe it's time to talk about moving them up to 1200 MHz, right? We should also remember that a major earthquake is due within the next thirty years which could slide Southern California right into the Pacific Ocean, resolving the 450-MHz repeater situation.

If the inactive hams have to pass up their share of the sale, there are likely to be some lively discussions over which of us have been "active" and which haven't. Perhaps we should work out the ground rules early on. My suggestion for proof of actual activity would be to ask for QSL cards showing postal dates. Too bad if you haven't been QSLing, which is a serious enough ham crime to warrant being declared a nonham anyway. This might be a good time to note the *73* QSL card ad in this issue. Better safe than sorry.

All this is still slightly iffy, of course, but I've been around long enough to remember the great scandal in our past where a certain group of hams were reputed to have swapped off 7,300–8,000 kHz, which used to be part of our 40m ham band, in exchange for enough for them all to buy rather nice homes and upgrade their standard of living substantially. So perhaps there's a precedent for us to start cashing in on our assets.

FCC Chairman Mark Fowler has recently been talking seriously about leasing radio frequencies instead of just plain giving them away as the FCC has so far. That makes a lot of sense because radio frequencies are a natural resource just as much as land, minerals, trees, water, and air. So if the FCC starts leasing their radio frequencies, it seems logical for us to sell off some bands we haven't been using much—like some of our microwave bands which are both enormously valuable and are totally unused by us. Found money, even if it's only a few million dollars for each of us.

What is that rumbling sound? I think it sounds like lawyers rushing to buy *Callbooks* to find clients and get us to enter a class action suit to get the bonanza started. Heck, even if we did get $750 trillion for 450 MHz, by the time the lawyers got through we'd be lucky to get anything ourselves. Keep this whole thing quiet, okay? The best thing for you to do is tear this editorial out and burn it so no lawyers will find it by accident.

But doesn't it gall you just a bit to have the investment bankers and arbitragers happily scamming billions while we poor hams sit here almost penniless on top of what is obviously a gold mine?

VIVA GARLAND!

Back last summer when I gave a talk at the Dallas hamfest, I was approached by Ken McNatt N5EDI and asked to address the Garland Amateur Radio Club. Hmmm, with my tight schedule, working in an extra visit to the Dallas area wasn't easy. Well, I had to be in Las Vegas for Ham/West in early November, so why not stop off a day in Dallas for Garland?

The Garland club managed to round up around 250 hams to hear me—doing a good job of packing 'em into the Performing Arts Center. The visit came off just fine,

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0745-080X) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

with a nice dinner before my talk so I could get acquainted with the club movers and shakers—and the local FCC official.

Though the subject of my talk was serious, I tried to go at it with humor. Unless a lot of 'em lied, I think the group enjoyed the talk.

Getting on my dance card isn't easy—I'm pretty well planned out a year ahead—but I can often take off an extra day now and then and stop off on my way somewhere to give a talk—as I did in Garland. I'm planning on getting to the Miami, Orlando, Dayton, Atlanta, and Watertown SD hamfests, the Chicago, Las Vegas, Osaka, Seoul, Taipei, and Hong Kong consumer electronic shows, Comdex in Atlanta and Las Vegas, my submarine reunion in Mobile and a mini-reunion in New London CT, skiing in Aspen and Italy, and (hopefully) skin diving/hamming on Truk, Ponape, Majuro, and Palau. How much can I do in one year?

Anyway, if your club is near a major airport and on my way to or from somewhere I'm going, let's see if a date can be worked out. The cost? My expenses. Shep K2ORS says if I charge $1,000 I'll get a much more attentive audience. Well, I don't particularly need the thou—what I do need is to get more hams to find out how much fun *73* is to read these days. We need to do everything we can to get our hobby growing again.

W2NSD/5 puts on the feedbag with members of the Garland Amateur Radio Club (photo by K5HGL).

EXTRA-CLASS LICENSES—$100

An old ham friend of mine called with news that competition has driven the cost of getting an Extra-class license down to $100 in Puerto Rico. It seems they were going for $500 until fairly recently when competition reared its ugly head, forcing the price down.

Apparently the FCC is well aware of the scam and seems uninterested. While there's been some talk of doing this by mail order, at present it's still necessary to get down to Puerto Rico to get your license. It was suggested that *73* organize some Group License Tours. We could even include a visit to the famous dish at Arecibo. I'll bet we could put together a great package.

The really nice thing about all this, according to my informant, is that it completely bypasses all that silly Morse code and technical stuff. Hams entering the hobby via this route will be expected to learn their theory and regulations later. Pedro. . .ooops, I mean my friend. . . said there are a growing number of Extra-class hams on the air who haven't yet learned the Morse code for the letter E. That's terrible. By the way, it's "dit," so I don't leave you wondering.

The Puerto Rico VEC program solves a lot of the problems which have been holding back other groups. Not only have they eliminated the code requirement, the rules, and theory, but applicants don't even have to understand English! Before this, the ham exams had always been given in English, which was a problem in this Spanish-speaking country.

Admittedly, $100 is a bit more than the ARRL VECs charge, but look at the extra service you get! Even if I could pass the code, theory, and rules test cold, I'd prefer going to Puerto Rico, just so I wouldn't have to worry. Peace of mind is worth extra. No one fails their ham tests there.

But, you say, if the FCC knows about this, surely they'll insist on retests. Not according to the latest I've heard. Oh, there was some talk of it, but the FCC doesn't have the manpower or the money to do it. No, it's up to us to keep our own house clean—if anyone cares.

You might look at this another way—if you don't start rounding up your would-be ham friends and getting them on a special *73* magazine pre-ham tour to Puerto Rico, we're going to be up to here in Spanish-speaking Extra-class hams. Either get busy or start taking Spanish lessons.

Sure, I'm making light of a serious problem. What else can I do? The facts seem to be as I've stated, so what else can we do but laugh at the ridiculous position we've gotten ourselves into?

We lost the FCC's respect when we turned down their effort to get us to accept a no-code license for 220-MHz operation. That's when they pulled the plug on us, so now we're on our own. If we don't like VEC groups selling ham licenses to all comers, okay, what are we going to do about it?

In the early 1960s we had a huge influx of no-code, no-theory hams into the hobby. These were licenses given away by hams to their friends and wives. For a couple of years it was very difficult to find anyone on two meters who knew anything at all about theory. In time, these people either learned theory and code or dropped out.

I had an editor of *73* who came into the hobby that way—given his ticket by a friend. He knew zero about anything. Well, he got interested and later made an excellent editor.

So, though I'm not serious about running tours to KP4, in some ways it isn't all that bad an idea. If we could get a million new hams at $100 each and even 30% of them took to the hobby, we'd almost double our strength.

The average newcomer to amateur radio spends about $600 in his first year. $600 million in ham gear sales would sure perk up our dying ham industry.

HELP WANTED

Now that we've got *73* growing (for a change), I have one of the more exciting—at least for a real ham—career opportunities around. If you know a ham or two who might fit the bill, cue 'em in.

I'm looking for a ham who enjoys getting on the air with new ham gear, so we can test new equipment and report on it in *73*. I'm looking for a ham who won't be fazed by packet or OSCAR—perhaps someone who can help me set up stations on Caribbean islands for mini-DXpeditions.

Of course there are always special projects—perhaps setting up a bulletin board so any reader interested can call in and find out about contests, FCC actions, DXpeditions, OSCAR, and such. Or maybe we want to do something different and unusual for Dayton.

What I have in mind seems to me like the ultimate in a ham job. Of course it won't hurt being involved with a fast-growing publishing group. We've several more publications in the works, complete with staff investment opportunities to share in the equity.

New Hampshire isn't one of the fastest growing states by accident. The combination of quality of life and lowest taxes in the country has helped this growth. It's an exciting place to live.

In order to make *73* even more fun to read, I'm anxious for us to test virtually every new ham product coming on the market. I want you to know what will be fun for you (or what sucks). If you're like me, you're not as interested in an exhaustive technical evaluation as in a review of how the equipment is to use in actual practice. What are the benefits when compared to other gear? Things like that.

It seems as if every time three hams get together at least one of 'em has the entrepreneurial spirit, so the next thing you know they're talking about putting a new ham product on the market. They get themselves all excited and soon one of 'em is calling me to see what I think. My answer is simple—you're crazy. No sane person would get into the ham business—a dying market of fussy, crotchety, penny-pinching old men like me.

But if hams are resistant to common sense and want to get in the business anyway, I think we owe them the best we can offer in survival—which means giving them all the promotion of their products we can in *73*. We want to announce their new products—test 'em and report on 'em—and in general help let you know why they're so excited about what they're doing.

The few of us working on *73* are already up to here, so we don't have nearly enough time to review new products—hence this plea for help.

If you know someone who seems to fit the bill, pass the word. I know I'll find it difficult to understand why someone interest-

ed enough in amateur radio to make a career isn't already reading *73*, but I'm game to try, if that's the case. Write to Wayne Green, WGE Center, Peterborough NH 03458, and explain clearly why I can't possibly get along without you.

VOICE VIA METEOR TRAILS

Amateurs pioneered the use of the ionized trails of meteors for communications, sending short bursts of CW to make contacts. It's a slow and difficult way to communicate, so it's never been popular.

A note from K2SE with an enclosure from *Defense Science and Electronics* magazine says that GTE has successfully sent voice via meteor trails. They did this by digitizing the voice—a sneaky way which we hams should have thought of. By digitizing the voice and sending the data at high speed in the second or less when a path is open, then turning the received signal back to analog, it's possible to get voice through the short, intermittent ionized trails.

Oh well, by being asleep at the switch we didn't get there first, but let's at least get there. Let's see what you experimenters can do with some two-meter meteor trail communications and digital voice. Who'll be first? I'm sure it'd be Sam Harris W1BU, if he were still with us.

AN EASY $100

A short piece in the October *Omni* struck a spark. It had to do with tuning in on computers from a distance—several hun- dred meters, the article said. Hmmm. That seems to have the making of a new type of business.

According to *Omni*, you need a TV set, a good directional antenna, and then a gadget for synchronizing the incoming data with the TV set's scan rate, which they say might cost about $15 to build.

We might do some experimenting to find better frequencies to monitor than the TV channels. If you knock together a synch unit which will allow you to display the received computer data on a TV set, you've got a great system for remote monitoring. However, if you were to park across the street from the Federal Reserve Board in a van with one of these, your motives might be suspected.

My suggestion for a new computer security business is to put together one of these and use it to demonstrate to businesses how vulnerable they are to spying. You should have no problem in getting a nice juicy contract to redo their computer cabling with shielded wire so they won't be broadcasting their secrets to anyone interested in tuning in.

I've got a $100 bonus for the best synch circuit submitted to me before March 1.

HAM/WEST

Though just in its second year, John Weaver W7IA's Ham/West convention in Las Vegas was, I believe, the biggest hamfest ever for the city. And that despite our having substantially fewer hams than we did fifteen years ago when Saroc was flying high.

Saroc got started mainly as a repeater-oriented gathering, with Art Housholder K9TRG bringing in suitcases of Motorola HTs, which he sold at incredibly low prices from his hospitality suite. Alas, Saroc eventually died of massive mismanagement.

While I'm not a big fan of Las Vegas, I do have to go there at least a couple times a year for business shows. The main ones are Comdex in November and the Winter Consumer Electronics Show in January. Yes, I enjoy the shows, but the "gambling" gets me. I put that in quotations because the odds are so stacked against you that there should be a more accurate word. Bleeding, perhaps. It's all around you, right from the slots as you get off your plane to slots in the grocery stores.

You have to have the willpower of an AA member to keep from dropping "just a couple" quarters in the ubiquitous slot machines. Like in the grocery, your change is red hot and begging to be put into the slots just a few feet away. Alas, once you put your first coin in a slot your fate is sealed. Doom. What follows is as inevitable as death eventually following birth.

The first two quarters go in easily. Big deal. 50¢, right? Well, unless you are out of quarters, there is no power on earth going to keep three or four more quarters from slipping right out of your pocket and into that bandit. You get oranges and plums, none matching. On the fifth quarter, you ring up cherries and two quarters plunk into the tin echo chamber for everyone in the casino (or grocery store) to hear. The machine is playing your song.

Can you pick up your two lousy quarters, take your 75¢ loss, and walk away? Legend has it that a woman actually did this in 1977. Plans are being made for a TV special to commemorate the event. You're 75¢ down and this damned machine is starting to pay off. As five more quarters go in, a sinking feeling starts—you're a couple dollars out to this crummy thief. Now you jam your quarters in with a grim determination to play until you hit the inevitable big one and get even again. After all, how long can it suck up your quarters without paying off? Ten dollars later you begin to develop some respect for the monster's appetite.

"Can you pick up your two lousy quarters, take your 75¢ loss, and walk away? Legend has it that a woman actually did this in 1977."

Hmmm, is it time to admit defeat and get the hell out of here? No, the next machine is sitting there and could well have been primed by the last sucker to dump a load—let's give it a couple of quarters and see. The whole miserable mess starts over.

There obviously has to be some reason to these things. I wonder, do the slots which are out front pay off better so they'll attract more players? Or are the back ones adjusted for a better payoff because fewer people will use them? We see the signs outside promising lavish payoffs from the slots, but we experience the usual sinking feeling and depression as the bandit gradually sucks us dry of our quarters and sends us home promising we'll never, ever, get caught in that net again.

The action is about the same at the craps table, only faster. You do, if you really know the game, have much better odds than with the slots. Indeed, I'm convinced that with some practice with a computerized crap game I'd be able to steadily win at craps. But it's a slow way to make money, so I haven't tried it.

Roulette has terrible odds, a sucker's game. Not as bad as Keno, but lousy. Vegas is paved from one end to the other with slot machines. With so many, and with so many people playing them, obviously they must be fun, right? I challenge you to find one slot player in the entire city who is smiling. After the first quarter it's a grim, losing effort to get back to zero. What you do is get down to zero.

Sure, there are some professionals who win regularly. But you'll see them at the craps tables and you'll see they know exactly what they are doing. They know the odds on every bet. I know you'll find this hard to believe, but the size of the betting area on the table is a good indication of the odds. The larger the betting area, the better the odds for the house. The very best bets for you aren't even on the table!

The pros bet the best odds they can and then watch how the dice are going. If they're running hot for a roller they bet with him. If they're running cold, they bet with the house. If there's no noticeable hot or cold trend, they come back later and see how things are running.

The head count for Ham/West was around 3,000 and everyone I talked with said they had a great time. The dealers who had brought ham gear to sell said they did best on Friday, before everyone had been viciously attacked by the slots and craps tables. Buying was much slower on Saturday. Well, I guess it's more "fun" to dump quarters into slots than go home with a packet radio unit, right?

Ham/West will be coming at you again next November, so start saving your quarters. . . for some ham gear. The dealers will have great prices for you.

Comdex was just a day after Ham/West, with about 85,000 in attendance. It's the biggest computer show of the year, making hotel rooms very difficult to find. But next year, computer industry hams—and there are hundreds—might come a couple days early and take in Ham/West.

The Ham/West banquet came off well, with Roy Neal K6DUE officiating and Bill Pasternak

Continued on page 106

LETTERS

SHELL SHOCK

I'm writing in response to your Never Say Die editorial of December, 1986. It is usually an informative and intelligent column, but what I don't understand is your desire to offend CBers with old, tired, recycled Polish jokes.

Half of your ranks started out as CBers, although most amateurs deny it, and if CBers didn't "upgrade" and get their Novice tickets, the Amateur Radio Service would never be able to increase its population.

Instead of trying to offend CBers, why not convince those old farts to honestly recruit new operators into the fold, instead of coming across with that old attitude of "I learned Morse code and if you want to become an amateur, so can you." Not everyone can master Morse code, it's as plain as that. And once you do, the only people you can communicate with are other amateurs. I suppose that's why most amateurs I know still have CBs in their cars. It's the only way they can talk to their XYLs at home, because Momma doesn't have her ticket.

Amateur radio operators and their leaders need to take a good look at their hobby and rewrite some of their rules if they want to bring some life and new blood back into their ranks.

I'm also amazed at KW1O's suggestion in the Letters column to Mad in Madison to pick a callsign and get on the air as a pirate—stating that it's no big deal and that he and Wayne started out in that fashion. What the hell is going on there? Can't you folks down at *73* get your acts together? Should a guy break his chops and go to classes and get his ticket or just pick out a callsign and start transmitting? How can one of your staff advocate such an idea? Perhaps I'm a bit naive, but that seems like a preposterous suggestion coming from a radio magazine whose purpose you say is to promote the hobby.

I think you and your staff were all sitting too close to the hull of that submarine when the shelling started and now you're suffering from group shell shock.

By the way, do you know why they call amateur operators "hams"? It's because they have the IQ of a pig's behind. Your column tells me something must be lacking in the average ham operator's mentality when you have to give them instruction on how to color in a map. I hope they can stay inside the lines!

Rick Chapter
Massapequa NY

Rick, anyone who reads your letter will understand my "desire to offend CBers."—Wayne.

Rick, it's not preposterous at all. Think about what I've been saying about ham radio for the past year or so: It's just a hobby. We're supposed to be having fun with amateur radio, but some folks get so bent out of shape trying to follow the "rules" that they lose sight of this simple fact.

I just talked to a fellow who's been a bootlegger for twelve years. He has WAS, WAC, and is going for DXCC. Is he having fun? You bet he is! The bootleggers are among the most active operators on the air.

Brief quiz: Who is smarter, the guy who spends a year trying to learn Morse code, fails his exam twice, and ends up with a Tech license when he really wants an Advanced, or the guy who just buys a TS-940 and operates wherever he pleases?

I don't advocate doing away with licensing, but neither do I begrudge the pirates their fun.—KW1O.

> ***"I think you and your staff were all sitting too close to the hull of that submarine when the shelling started."***

HAL IN HONOLULU

I read the "Thumbs Down" letter in your October issue—would have to agree with the author that he does indeed seem to be a dumb bastard—then read with great appreciation the December letter from "Mad in Madison." Great appreciation because he states so well the apparent state of mind of much of the non-ham community coveting the frequency allocations we have luxuriated in for so many years.

My appreciation is even greater when I realize that *he must be a ham*. Who else would "have friends I have been trying to talk into getting their ham ticket for years" and "have gone to many hamfests around the state"? Who but one of us could know us so well, dirty laundry and all?

Thanks, Mad in Madison, for hanging it all out there. Perhaps your letter will "rouse a little rabble" and get some of us thinking about the image we present to our fellow hams, possible future hams, and to the public.

Perry, you had to have his true identity before you would publish his letter. My bet is that he is a licensed ham, probably Extra class, and quite possibly a member of the *73* staff. Right?

Hal Sprague KH6GPI
Honolulu HI

Despite his letter sounding like an excerpt from Never Say Die, Mad in Madison is NOT, in fact, on staff here at 73. The letter was typical of a type we receive periodically which call for complete anarchy on the airwaves. Most of these folks are NRA types who haven't really thought much about what they're saying—they just mimic words that they have heard from other "activists."

Just as bad, though, are the hams who loudly and blindly cling to the current system just because they haven't the courage to think outside of it. Instead of just lashing out at new ideas, we have to consider questions such as, "What would ham radio be like if we had no FCC?" You may be surprised at the answer.—KW1O.

LIST

If we wonder why amateur radio is dying, enclosed is a partial list of those hobbies that do not require a license or exam: baseball, football, photography, computers, model railroading, scuba diving, stamp collecting, archery, bowling, jogging, video games, model cars, part-time jobs, tennis, etc., etc. Amateur radio requires study, outmoded code requirements, exams, and hoping that you pass. A kid of 12 or 13 does not want to be bothered with that. A hobby is to enjoy, not frustrate.

Ben Alabastro WA2PXR
Frankfort NY

Sorry, you didn't convince me. Everything that you mentioned in your list has entry requirements. Granted, you don't need a license to collect stamps, but you do have to spend a great deal of time learning about them. Sports require lots of practice if you want to become proficient at them. Ham radio is no different than anything on your list.

Part of the reason we're losing kids is that amateur radio is basically pretty boring. Years ago it was a great thrill to put together a little rig that would span the globe. These days all we do is drop a kilobuck on a pre-built do-all transceiver and plug it in. And it's not like hams are interesting to talk with, either. How many times can a 13-year-old hear, "Weather here is rain, rig here is. . ." before the radio is shut off permanently?

Thank goodness there are hams involved in pushing the edge of technology; in packet, digital television, satellites, signal processing, spread-spectrum, and so on. I think a friend of mine said it best when he stood up in a ham radio industry meeting and said, "We're just waiting for you old folks to die so that the young people can get on with this hobby."—KW1O.

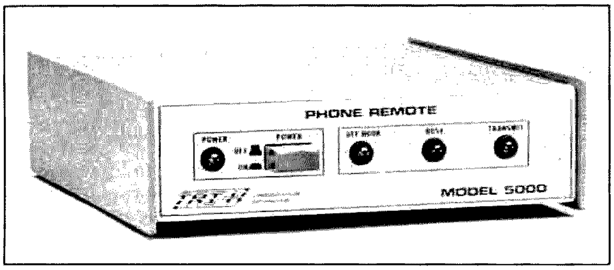
ENTANGLED

Having gotten tangled up in the legally binding contract that NSD slithered into the lower corner of page 4 of the December, 1986, issue, I have searched the magazine advertisements from cover to cover to find the cheapest way out of this unscrupulous trap. My suggestion to others so entangled is to circle 142 on the Reader Service card and also buy some of your QSL cards. Hopefully the magazine will not stoop to such depths again. I shall endeavor to keep subsequent issues out of the hands of literate minors. And for the price of a 22¢ stamp, I will be one of the 17 people taking a gamble on the Feedback drawing.

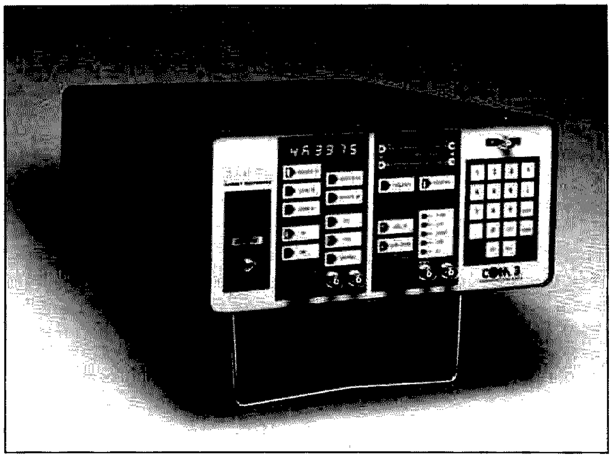
Bradshaw B. Lupton, Jr. K1TE
Shrewsbury MA

NEW PRODUCTS

Number 21 on your Feedback card



The model 5000 Phone Remote from Tri-H Communications.



New communications analyzer from Ramsey.

PHONE REMOTE

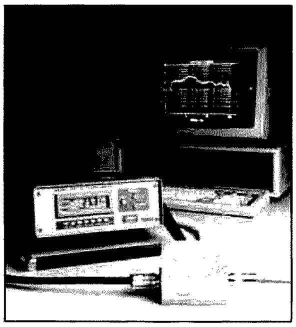
Tri-H Communications now offers the Phone Remote model 5000A, a product that allows operation of an HF, VHF, or UHF base station from any touchtone™ telephone. The model 5000A requires no internal connections to the transceiver and includes a security code. Programmable activity and push-to-talk timers with time-out warning beeps are provided in case the telephone connection is lost.

For complete information, check Reader Service number 216.

BIRD MODEL 4421

Bird Electronic Corporation has introduced the model 4421 rf power meter, a programmable, microprocessor-based instrument that measures forward and reverse power to 1 kW from 1.8 MHz to 1 GHz. The unit features an accuracy of ±3%. Two sensors cover the frequency range; each sensor carries a calibration profile in a reprogrammable memory. An optional interface provides for remote operation from a GPIB- or RS-232-equipped computer.

For more information about the model 4421, check Reader Service number 214.



Bird's model 4421 rf power meter.

SUPERSCAF

Aftronics, Inc., has announced SuperSCAF, a digitally tuned switched-capacitor audio filter for CW, SSB, RTTY, and other narrowband modes. The unit incorporates a crystal-controlled 14th-order elliptical bandpass filter whose upper and lower cutoff frequencies are programmed via a front-panel thumbwheel switch. Cutoff points may be selected from 300–3,500 Hz in 100-Hz steps. The initial skirt slope is 150 dB per octave with an overall stop band attenuation of at least 51 dB. Passband ripple is less than 0.2 dB.

SuperSCAF is available for $137 in kit form; please check Reader Service number 215 for more details.

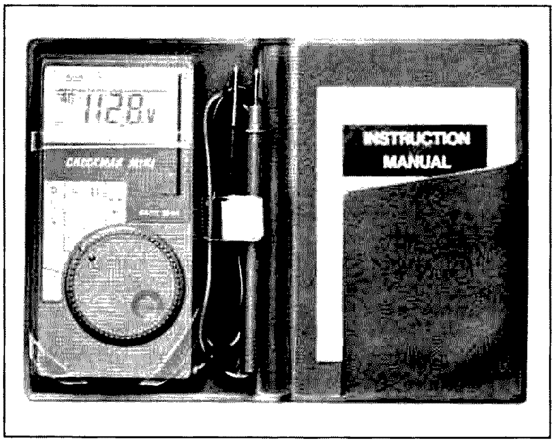
RAMSEY COM-3

Ramsey Electronics has introduced the COM-3 programmable microprocessor-based communications service monitor. The COM-3 covers 100 kHz to 1 GHz in 1-kHz steps and features keyboard entry of parameters, programmable memory, high sensitivity in receive mode, full transmit protection, a built-in frequency counter, and an LED bar-graph deviation indicator.

The COM-3 runs on a built-in rechargeable battery and weighs less than 10 pounds, making it ideal for portable use. Suggested list price is $1,995; for further information, please check Reader Service number 205.

NEW PRODUCT OF THE MONTH

This little gem caught our eye:



TESTON'S CHECKMAN MINI

Teston's card-size Checkman Mini fits in your shirt pocket and gives immediate voltage and resistance measurements with built-in autoranging. The unit can handle up to 20 megohms and 500 V ac or dc, displaying the value on a 10mm-high LCD. The Checkman Mini also features an audible continuity checker and diode tester.

The Checkman Mini retails for $35; for complete information, please check Reader Service number 217.

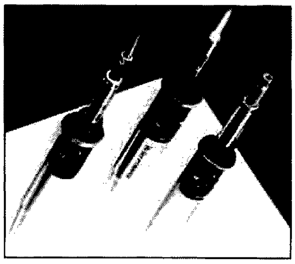
220 TRANSVERTER

Microwave Modules of Liverpool, England, has announced the MMT 220-28 15-Watt linear transverter for 220–225 MHz. The unit connects directly to the transverter jack on your transceiver and features a MOSFET front end for excellent receive performance. Transmit mixer sensitivity for full output is 1 mW.

The MMT 220-28 retails for $250; for more information, check Reader Service number 208.

WELLER PYROPEN

The new Pyropen from Weller® is a versatile, LP-gas catalytic soldering iron, torch, and hot-air gun. The handle stores enough gas for about three hours of operation and takes only a few seconds to refill. A control lever regulates the gas volume and



Weller's Pyropen gas-powered soldering iron.

Davle Tech's rechargeable power screwdriver.

adjusts the temperature for soldering. Temperature control ranges from 392° to 932° F. A number of tips are available, including a power chisel, a tapered needle, a micro spade, and a tapered pyramid.

Reader Service number 210.

RECHARGEABLE SCREWDRIVER

Davle Tech, Inc., now offers a powerful multipurpose screwdriver which runs on rechargeable NiCd batteries. The tool features an LED battery indicator, a forward/reverse switch, a detachable pistol grip, and four driver bits.

Reader Service number 206.

JENSEN STRIPPER

Jensen tools has introduced a thermal wire stripper designed to remove thermoplastic insulation from 14–30 AWG wire. The specially shaped nichrome element heats to 450° F in less than five seconds, and Jensen claims that, due to the minimal mass of the element, it will not burn you if you touch it during use.

For more information about Jensen's thermal stripper or for a free catalog of Jensen tools, check Reader Service number 211.

IRI FILTERS

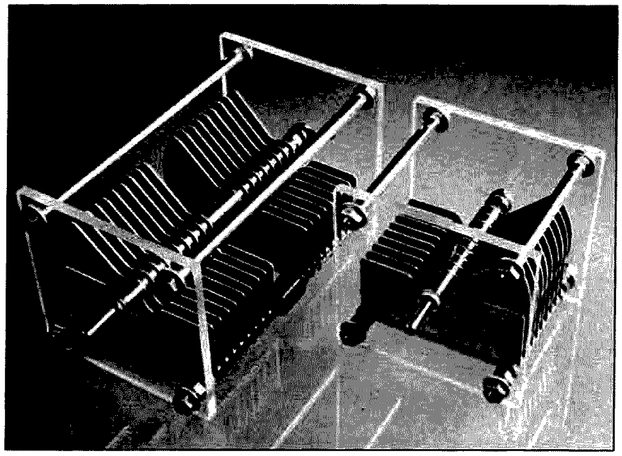
International Radio, Inc., has added a number of 6- and 8-pole filters to their line of products. The new filters cover the ICOM 730, 735, 740, 745, 751, R70, R71A, 271, 471, and 1271, and Kenwood's 930, 940, 830, and R-2000. Also available from IRI is a CW switch kit for the TS-940/930/830, which yields a new 250-Hz CW position.

For more information on IRI filters, check Reader Service number 212.

NEVADA CAPS

Nevada Communications of Portsmouth, England, has announced two high-power variable capacitors for amateur use. The TC-250 is a 13–250-pF capacitor and the TC-500 gangs two sections together for up to 500 pF; both models have a breakdown voltage of 7.8 kV and a plate air gap of 2 mm.

The capacitors are approximately $30 and $40 for the TC-250 and the TC-500, and both are available at a lower price in kit form. For complete details, please check Reader Service number 213.



Nevada Communications' variable capacitor kits.

CB ON-GLASS

A new On-Glass® CB antenna designed to look like a cellular telephone installation is available from The Antenna Specialists. The model M-906 uses a no-holes mount which couples rf through the windshield. The black whip is protected from the elements with Duracoat™, a highly resilient material resistant to abrasion and extreme environments.

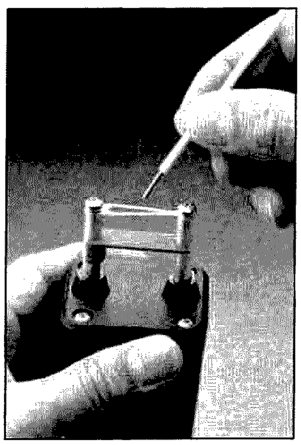
For further information, check Reader Service number 207.

PCB DESIGN

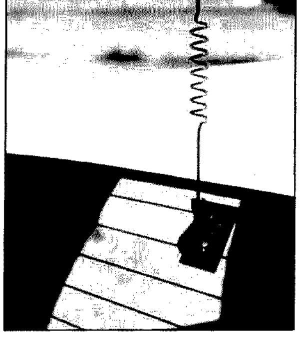
Project:PCB is the name of new CAD software offered by DASOFT Design Systems. The package assists in the design of multilayer printed circuit boards with schematic capture, automatic routing, and board layout (a plot routine generates camera-ready art).

After a schematic is entered using the mouse-driven editor, pin connections are defined. Next, the board itself is designed by defining the size and shape of the substrate, location and size of cutouts, and the footprint and placement of parts. A library of standard parts is available, or you can build your own. The routing algorithm then takes over and lays out the traces. Finally, the plot section generates proof copies with problem areas marked, or camera-ready artwork.

Project:PCB requires an IBM XT, AT, or compatible with 640K RAM and at least 10 megabytes of hard-disk storage. List price is $950; check Reader Service number 209.



Thermal wire stripper from Jensen tools.



New On-Glass CB antenna from Antenna Specialists.

73 Review

ICOM IC-120

1.2-GHz Mobile FM Transceiver

by Peter H. Putman KT2B

ICOM America, Inc.
2380-116th Avenue NE
Bellevue WA 98004
Price class: $580

Number 29 on your Feedback card

ICOM of America has been making great strides toward a full product line of UHF radio equipment in recent years. Along with their IC-1271A (reviewed in September, 1986), ICOM also offers the IC-120, a mobile, 1-Watt, synthesized transceiver for the 1260–1300-MHz range.

I received the 120 and the 1271A for review at the same time, and I intended to run some tests using both in the low-power mode. My plan was thwarted by a blown front end in the 120, so an alternate setup was arranged for the replacement 120.

Features

The 120 is about the same size as ICOM's popular IC-27A/37A/47A series FM radios, although it uses a different bracket. Frequencies are selected by two vfo's in 10- or 20-kHz steps, with six memory channels incorporated. The transmitter is rated at 1 W output power across 50 Ohms, drawing 2.0 Amps while doing so. The receiver is rated at less than .3 uV for 12-dB Sinad, and the squelch sensitivity is in the range of .25 uV.

As far as actual operation goes, it's easy to set the controls and program the memories. The frequency offset is programmable, which is a good thing since the Japanese seem to have one standard and we in the U.S. another! As you can imagine from running 1 Watt output, there's no low-power switch. Other controls allow you to step up and down in 1-MHz increments, which is about as fast as stepping up and down in 100-kHz increments on a 144-MHz radio. . . SLOW. Don't forget, we're trying to cover 40 MHz of bandwidth here—more bandwidth than 50, 144, 220, and 430 MHz put together!

ICOM employs a type N connector as on the 1271A. Another rear-panel connector is designated "Accessory Socket" and allows remote T-R keying of the 120, supplies remote 13.8 V dc, and allows for a discriminator meter connection. Incidentally, the remote keying connection would be very useful for a 1260-MHz remote base link or repeater link. An external speaker jack is provided as well.

An unusual feature is the RIT control. You don't see these on FM transceivers on lower frequencies, but any synthesizer error of, say, 1% at 144 MHz quickly becomes 9% up here. Therefore, someone transmitting on what he thought was 1260.00 MHz could actually be as low as 1236.97 MHz or as high as 1283 MHz! Fortunately, ICOM rates the frequency stability within .0005%—which is still off by 6.3 kHz; hence the need for the RIT. In this case, the RIT still covers +5 kHz, so it should do the trick.

The standard offset provided is ±10 MHz. You can scan the six memories or between any two frequencies programmed into memories 1 and 2. Scanning speed is adjustable through the top cover, as is the scan pause interval, stopping on a busy channel, and CPU reset.

Test Equipment

Not having any accurate test equipment to verify claims (at least as far as receiver sensitivity goes), I decided the best way to find out about the receiver was in a mobile situation. Two Larsen Electronics collinear antennas for 1300 MHz were obtained courtesy of the factory for this test, and I installed the 120 in my Honda with the antenna fed by 17 feet of low-loss Belden 9311 RG-58/U. Its loss at 1300 MHz is rated at 16 dB per 100 feet. Incidentally, the Larsen antennas use a special mount—type MM-NMO—and will definitely not work with the more conventional LMO series mounts.

Photo A shows the Larsen 1300-MHz antenna atop the Honda. For purposes of this test, I again enlisted the services of Steve Katz WB2WIK who agreed to put the hodgepodge of stuff shown in Photo B into his Toyota. It's actually my trusty Kenwood TR-9000 with a Microwave Modules MMT-1296/144 and appropriate connecting cables. This setup runs about 1.5 Watts output, on par with the 2+ Watts I measured from the 120 with the Bird 43 and the 5-W, 400–1,000-MHz slug.

Test Results

To say the range is limited when running low-power levels at

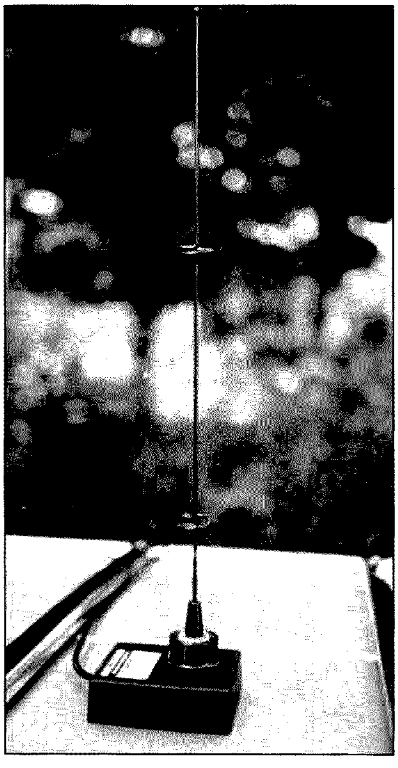


Photo A. The Larsen 1300-MHz collinear antenna with NMO magnetic mount in position on the Honda's roof.

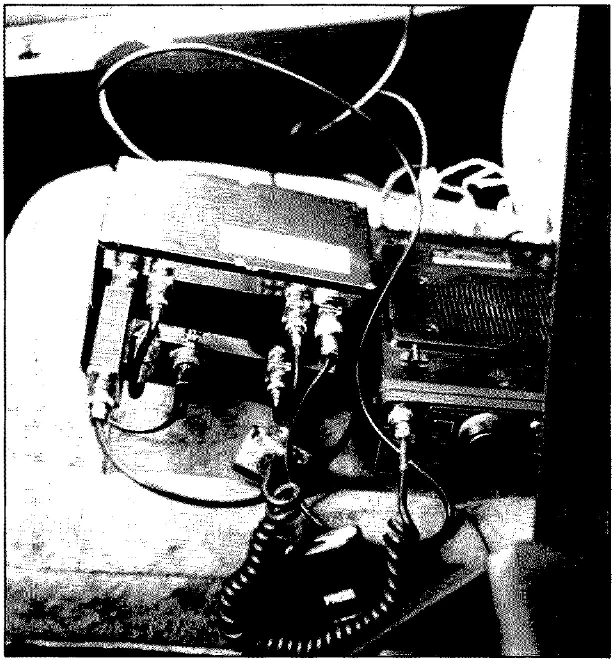


Photo B. The companion setup on 1296-MHz FM—an MMT-1296/144 and TR-9000 exciter. A Larsen antenna was also used here.

1296.200 MHz (our test frequency) is an understatement! At one point, Steve and I were no more than a quarter mile apart, yet I couldn't copy him at all due to foliage attenuation. Steve positioned himself atop one of the higher spots around here on a ridge with good views in all directions, while I drove up and down smaller hills nearby.

Results were as I expected: full-quieting copy when line of sight was less than about one mile, and driving behind ridges within a half mile resulted in complete loss of signal. Audio reports were excellent. Incidentally, the 120 uses a 3SK48 in the front end, which I believe is a low-noise MOSFET (also used in ICOM's 430-MHz gear). This radio would benefit from a preamp if running the outboard 10-Watt accessory amplifier, model ML-12.

The results obtained from the driving tests indicate that you probably would need the 10-Watt amplifier most of the time, especially if trying to access a repeater. In hilly areas, such as here in northern New Jersey, it would be all but impossible to work a repeater unless you were within line of sight of it. Based on these observations, stations living in relatively flat areas, such as the Midwest and Southwest, using repeaters on tall structures with long horizon sightlines, will get the most out of the 120. Out here, it's all but useless except for local area net operation and possibly point-to-point links.

Conclusion

This radio is not for everyone. I couldn't think of any particular use to put it to except for low-power point-to-point links or as a remote base link. I think it would be very popular in a city environment where a wide-coverage machine was line-of-sight to most of the users. The apartment dweller restricted by antenna size could have a ball with a small 1260-MHz yagi on a balcony for simplex or repeater work. And, of course, it would be ideal for point-to-point packet communications where privacy was desired.

Remember that turning the average 1296 yagi 90 degrees away from you puts the signal down over 80 dB, and you have the possibility of co-channel operation. One station could be horizontally polarized and the other vertically polarized! Could this be a solution to FM channel congestion? Those who have the right setup might wish to try it with the 120. Now if ICOM would just come out with a multimode version of this radio.■

Mirage/KLM 1.2–44 LBX

44-element 1.2-GHz Yagi

by Peter H. Putman KT2B

Mirage/KLM
PO Box 1000
Morgan Hill CA 95037
Price class: $154

Number 30 on your Feedback card

With the expansion of major equipment manufacturers (such as ICOM, Kenwood, Microwave Modules, and SSB Electronics) into the 23-cm band, it was only a matter of time before we started to see new antennas for this band. Some have been around for a while (F9FT 23-element yagi, Jaybeam, Down East Microwave loop yagi), while others are relative newcomers (F9FT 55-element long boom and KLM 1.2–44 LBX).

Readers will remember that the F9FT 55-element yagi was reviewed back in April, 1986. Using a formula derived by engineers at MIT, the measured gain was found to be within .25 dB of the claimed gain. I obtained a pair of the KLM 1.2-44s to make that very same measurement—but I'm getting ahead of myself!

The KLM 1.2–44 LBX comes essentially complete from the box. You need only push the two boom sections together and attach the horizontal boom brace and mast mount, as well as the pre-assembled and tuned driven-element/reflector section. Assembly time from opening the box is about 20 minutes and requires only a screwdriver and 11/32 and 5/16 nutdrivers. The two boom sections are joined where one of the elements passes through the boom, and the element insulating collar keeps it secure. Photo A shows the completed beam.

The horizontal boom brace runs underneath the antenna boom. The brace is attached to the boom using clamshell-type assemblies. The boom brace is what gets bolted to the main mast, since most masting is such a significant portion of a wavelength at 23 cm that it would severely de-tune any element it was behind or in front of.

The driven element/reflector is clever. It consists of a hardline balun and stiff-wire driven element (folded-dipole design) encased in a hard plastic. Also encased is the rear end of the type N connector, and fitted over it and secured with a nut and lockwasher is the screen-type reflector. A secondary strap from the screen to the boom makes the ground connection for rf. See Photo B for a close view.

The entire assembly is fit snugly into the rearward section of the boom (identified by the screw hole for the reflector ground) and secured with the first director. Very strong! In fact, the whole antenna is built like a tank! Compare it to the plastic-supported elements on the F9FT or a standard loop yagi and you'll see that with the 1/4"-diameter aluminum rod elements, it would be pretty hard to break anything on this beam.

Speaking of which, this design is unconventional because the elements do go through the boom as opposed to being supported above it. Does it de-tune the design? Not at all, as KLM claims 18.2-dBd gain for the 1.2–44 LBX. In my tests, I set out to verify these claims. The test range was two masts 10 feet high, 70 feet apart (100 wavelengths at 23 cm).

One problem I was going to have was the accuracy of my rf millivoltmeter at 23 cm, since the rf head was only accurate to 600 MHz. Some calibration tests were performed using the IC-120 as a signal source. It developed 2.6 Watts into a 50-Ohm dummy load, as measured with a Bird 43 and 5-W slug. These measurements were verified on a 25k slug (25 W, 1.1–1.8 GHz). Then, the rf millivoltmeter was driven through pads known to be good at

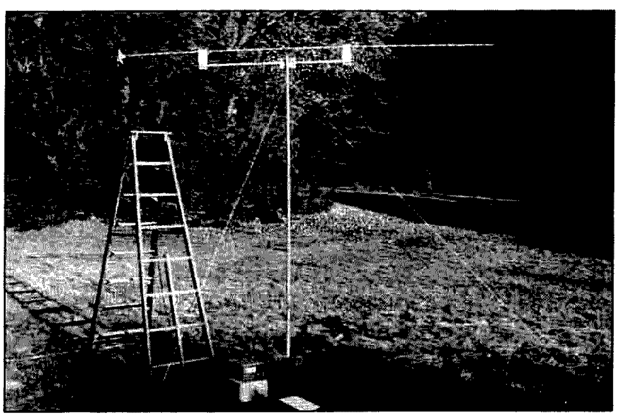


Photo A. The completed 1.2–44 LBX in position and ready to test. Note the unusual boom brace.

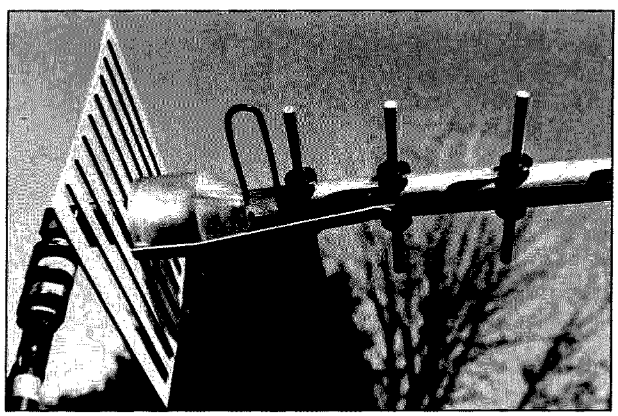


Photo B. The driven element and reflector assembly up close. The balun is made from miniature hardline.

1300 MHz to arrive at the final figure that read 10.5 dB high at 1296.00 MHz.

The next step was to set up the IC-120 with another Bird 43 and the feedline to determine its loss. This was calculated to be about 1.5 dB (it was a little more than 13 feet of 8214 RG-8/U) and was verified with two Birds and a dummy load. Locking the IC-120 on with a constant power source, I then rotated the companion 1.2–44 LBX for maximum signal. The reading was +12.5 dBm. Subtract 10.5 dBm from the correction factor, and you have a reading of +2 dBm, or 1.75 mW.

If you use the formula in Fig. 1, dividing Pr by Pt (.00175/2) results in a figure of .000875, or 8.75×10^{-4}. Next, use the left-hand side of the formula as follows: R = 99.39 wavelengths (70 feet) and λ = .231 (23.1 centimeters @ 1296.100 MHz). Putting these numbers into the formula 4πR/λ results in the value 5,406.65. The square root of .000875 is .0295, and .0295 x 5406.65 = 159.93. This numerical expression of gain is for two yagis, so divide that value by two: 159.93/2 = 79.96.

Now, calculate 10 log10 of 79.96, and the answer is . . . 19.02 dB. Therefore, one of the two 1.2–44 LBX yagis exhibited 19.02-dB gain in the test setup. This certainly is close to what KLM claims at 18.2 dB, and in fact theirs may be a conservative rating.

$$G^2 = (4\pi R/\lambda)^2\, Pr/Pt \quad \text{or} \quad G = (4\pi R/\lambda)(\sqrt{Pr/Pt})$$

G = Gain expressed arithmetically (not in dB).
λ – Free space wavelength in units.
R = Range of separation of antennas in same units (λ).

Fig. 1. Formula for calculating gain of either of two identical yagis.

While no data was available on polar plots, I would suspect that the KLM is not quite as sharp as the F9FT 55 element. I'll try to update this data through actual use in the coming months. By the way, input vswr was on the order of about 1.4:1, whereas KLM claims better than 1.5:1—again, a conservative rating.

Conclusion

The KLM 1.2–44 LBX is a sturdy, well-designed antenna for the 1260–1300-MHz band and exhibits plenty of gain. It is lightweight (less than 10 pounds) and good for portable operation as well, owing to its rugged construction and easy assembly (or disassembly). The rigid, large-diameter boom also aids against sagging and element misalignment. Reader Service number 201.■

Telex/Hy-Gain OSCAR Antenna System

Telex Communications, Inc.
9600 Aldrich Ave. So.
Minneapolis MN 55420
Price class: $365

by Jim Godron N1EJF

Number 31 on your Feedback card

The Telex/Hy-Gain OSCAR antenna system represents a good choice for anyone considering satellite work in a serious way. The setup (model number 218S) consists of a 30-element 435-MHz antenna on a 134" (4.2-wavelength) boom, a 16-element 2m antenna on a 168-3/4" (2.1-wavelength) boom, and a hollow five-foot fiberglass cross boom. Everything is shipped via UPS in a single box.

The 435-MHz antenna consists of two boom sections that are held together at the point where the antenna mounts to the cross boom. The sections fit into a sleeve that is compressed by the mounting assembly. This arrangement appears to be quite secure, and I anticipate no problems from it in the future.

There is a small (12") section that is a coax support bolted in place at the rear of the boom. On the unit that I received, the coax support was not drilled. It was a fairly simple matter to drill the support, but I was surprised, given the overall quality of the antenna, that this was required. I brought this to the attention of the factory, and when they checked the rest of their stock, no other units were found to have this problem.

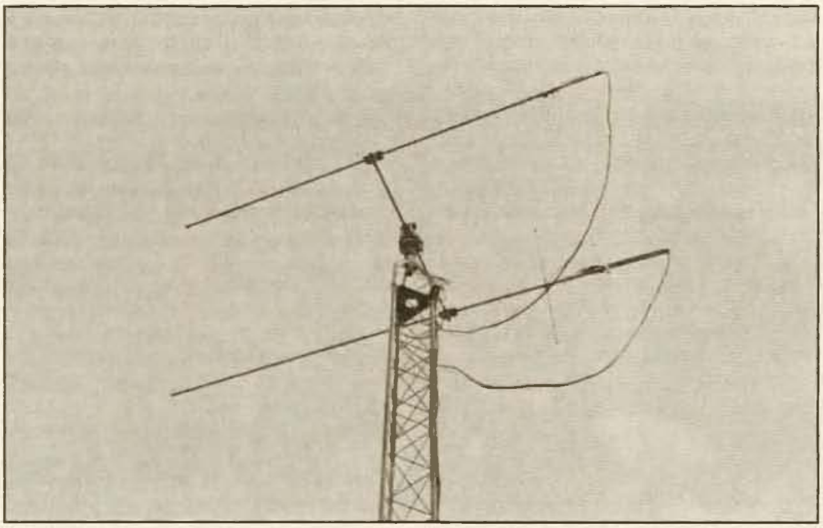


Photo A. Telex/Hy-Gain's OSCAR antenna system.

The 2-meter antenna consists of three boom sections. The front section fits inside the center section and is bolted in place. The rear and center sections are joined by an internal sleeve. The boom is held to the mast by the same type of clamp used on the 70-cm antenna.

The elements on both antennas are precisely cut and color coded. They fit through two insulators and are held in place by stainless-steel slip nuts. Measurements are given to 1/32". I suggest that you triple-check each measurement to maintain that 1/32" standard, as the measurement of the exposed sections of the elements must be EXACT.

The 70-cm antenna uses a delta match and the 2m antenna uses T-matched driven elements. These high-efficiency designs are easy to assemble, but I noticed on both antennas that when exact measurements were observed, the encapsulated feedpoints were too narrow by about 1/4". If the error were absorbed by each side of the driven element equally, the feedpoints could be off by as much as 1/16". I think it's important to point out that I have noticed no operational problems because of this.

In addition to the SO-239 (on the 2m antenna) and the N connector (on the 70-cm antenna), there are also two wires coming from the coax harness. These wires are attached internally to switching relays. The relays are rated at 200 Watts and allow you to select either right- or left-hand circular polarization with the application of 9 to 15 V dc. The Kenpro rotator that I'm using requires six conductors for each rotator (azimuth and elevation). By using 8-conductor rotor cable, I can easily use this most interesting feature.

The manufacturer suggests that you allow at least four hours for assembly of each antenna. While it didn't take me nearly that long, I do think it's a good idea to work in an unhurried manner.

I assembled the antennas over several evenings in the basement, so it didn't present much of a problem when the 2m antenna

turned out to be missing some hardware. I phoned Telex and had the parts the next day. I had a very interesting conversation with Telex about their quality control process, and I'm convinced that the several very small problems that I had are the result of my getting the first antenna off the line.

The installation of the system went fairly easily. We put the antennas and rotator together and then hoisted the whole thing to the top of a 40-foot tower. The antenna required this height in order to clear the trees, and I was a little concerned about the long run of transmission line.

Joel Knoblock of RF Connection came up with the solution in the form of International 9086 cable. This is the imported version of 9913, and Joel tells me that the specs may be a little better. In operation, the 9086 seems to be doing the job, and I am no longer concerned about the losses.

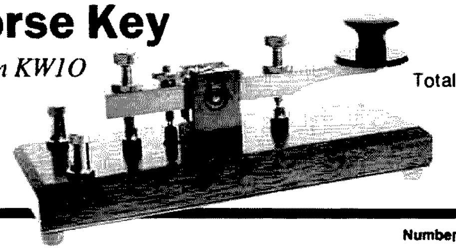
ICOM very kindly provided me the use of IC-271H and IC-471H transceivers, with power supply and mast-mounted preamps for 2m and 70 cm. These full-featured state-of-the-art rigs have allowed me to fully experiment with the antenna array, and I have been nothing short of delighted with the results. In addition to their usefulness as satellite antennas, these antennas have produced excellent results in terrestrial work as well. The 2m antenna is an outstanding performer on FM and SSB, and I find that I use it more than my other 2m antennas. As an indication of this performance, I can hear a distant repeater S7 or S8 on my omnidirectional antenna, while on the Telex antenna it will be +40 dB over 9. I have routinely conducted S9+ QSOs over 115 miles on FM using 80 to 100 Watts.

Conclusion

The Telex OSCAR system is an outstanding performer as a satellite system, and does double duty as a great terrestrial array. Despite the minor problems encountered in construction of the beams, I would recommend this setup as an excellent value for VHF/UHF enthusiasts. Reader Service number 202.■

Kent Morse Key

by Perry Donham KW1O



Kent Industries
Distributed by:
Total Electronic Concepts
PO Box 400
Lincoln MA 01773
Price class: $50 (kit)
$60 (assembled)

Number 32 on your Feedback card

I'll tell you right off that I'm a CW freak. For some reason, I get panicky when there's a microphone in front of me—but give me a Morse key and I'm right at home. I generally use an electronic keyer and my Bencher paddles, but I'll occasionally pull out a straight key and pound brass for a while. I enjoy the cadence of hand-sent code; it tends to relax me.

You can imagine my glee, then, when I was asked to review R.A. Kent's solid-brass key. I had admired them at shows and often thought of buying one, and here it was in my shack!

> *"If you love Morse, you'll certainly appreciate this work of art."*

The keys are sold as kits or as assembled units. Mine arrived assembled, so I can't tell you if it's difficult to put together. My guess is that it's not hard at all, judging from the way things fit together so nicely and the clarity of the instructions. The brass parts are apparently hand-turned and beautifully brushed. A ham visiting the office happened to be a machinist, and I showed him the key. The fellow was beside himself! "Look at the way they've knurled these knobs! Look at these little shoulders on the fittings!" I was afraid that I would have to frisk this guy when he left.

The base is finished oak, a nice complement to the color of the brass. The whole unit is quite heavy and doesn't slip even during vigorous bouts of pileup breaking. The knob is a large Navy-type, the kind with a platform.

I should stop going on about how nice the thing looks and talk a bit about its feel. It feels just as good as it looks! The action is very firm and can be adjusted finely. The contacts are solid silver, and I noticed none of the clicking or arcing usually found in keys of lesser quality. My arm got tired after fifteen or twenty minutes of operation because the key is tall—I prefer something like a J-28 that rides very low to the table. It takes a well-developed wrist to work the Kent key, but the action is extremely smooth due to the circular bearing races and the close tolerances of the brass pieces.

Obviously I like this key. I would suggest that Kent make a little brass plate to go on the oak that could be engraved with a callsign; it would be perfect for presentations. If you love Morse, you'll certainly appreciate this work of art. The keys are made in Britain, but you can get one from Total Electronic Concepts, Kent's American distributor. For more information, check Reader Service number 203.■

Sony AIR-8 Scanner

by Marc Stern N1BLH

Sony Corporation of America
Sony Drive
Park Ridge NJ 07656
Price class: $269

Number 33 on your Feedback card

Have you ever wondered why some manufacturers do the things they do? Take Sony, for instance. The giant electronics firm recently entered the hand-held scanner market.

Now you'd think that with Sony in the game as a major player, the other hand-held scanner builders—Regency, Uniden/Bearcat, and Radio Shack—would have something to worry about. After all, Sony is the company that capitalized on the success of its Walkman/Watchman/Everythingman personal electronics devices, as well as its television receivers. But, after using and evaluating the AIR-8 from Sony for several weeks, I can say that the others have nothing to worry about. In fact, it has to make you wonder about the company's ultimate commitment to the receiver market or at least what its perceptions of that market are.

For starters, it's hard to judge exactly what this scanner is. It attempts to be five things to five different users. On one hand, it includes the AM broadcast and LF bands, so the AMer or LFer might be served by it. On the other hand, it also has the FM broadcast band (where you can hear the latest in hard rock, I suppose). But what does this have to do with scanners? Further, it covers VHF from 136 to 174, and it covers the aeronautical band.

So, who's supposed to be the buyer? Everyone, I guess, or those who want to hear as odd an assortment of frequencies as I've seen in any receiver in the last 10 years.

Quite frankly, the AIR-8 seems to me to be more of a token response to the marketplace than a real attempt at taking a significant measure. Why, from one standpoint alone—sensitivity—the others have absolutely nothing to fear.

During my evaluation, I compared received signals with my Kenwood TR-2600 and its standard rubber-ducky antenna and the AIR-8 with its huge—11-inch—floppy, rubber, helically wound antenna. In almost every instance, the AIR-8's received sensitivity just wasn't up to snuff. Local repeater conversations that were 40+ on the HT were noisy on the AIR-8 and tended toward motorboating as if the signal were multi-path.

Now you might think that this would indicate the AIR-8 is even more sensitive than the Kenwood because it was hearing multi-path where the Kenwood was steadfastly picking up the signal. However, it must be realized that the Kenwood's S/rf meter needle was pegged, and I really don't think the scanner, which is a compromise device to begin with, was nearly as sensitive.

As further proof, there are several packet stations on 145.01 in my area that are STRONG on just about any other receiver I have in my shack. On the AIR-8, I could barely hear them.

Another indication of the inability of this scanner was shown to me by the same packet stations. As I was listening to a busy local repeater more than 1.6 MHz above the packet frequencies, I suddenly heard the telltale "braaap" of one of the locals. The packet burst was coming through the AIR-8 and was being superimposed on the FM phone signals I was listening to.

To be fair, I do live in a high rf region. There are more public-service, common-carrier, land-mobile, satellite, and trunked radio services in this area than in any other local area that I know of, and it seems my home is in the center of the signals.

But this still doesn't account for the fact that there seemed to be image signals at the low end of the air band—radio stations overpowering other signals—that were roughly 10.7 MHz removed from their fundamental frequencies. Further, why the manufacturer chose to start the air band just above the FM broadcast band is a mystery to me.

And, it's a feature that overpowers one of the nicer aspects of the scanner. The air band seemed to be where the AIR-8 was most sensitive, and the reception of some big jumbos on their way to this area's major airport was crystal clear. I also heard the control tower at several small airports and talk-around between the tower and planes. So, it makes you wonder.

It also makes you wonder why a rig that should be state of the art really isn't. Take birdies and images, for instance. As you scan through the public-service (PS) band (VHF), you find the scanner locking up all over the place and you hear image signals, signal-related emissions, and birdies. The scanner seems to lock up about two or three times per hundred kHz of band scanning. Those lock-ups occur from birdies and images, as well as from signal-related noise.

Again, this could be a product of the high rf environment surrounding the test site. But, on the other hand, the other scanners that are around here have few of the same problems. In fact, about the only problem the Sony has in common with the others is synthesizer-related birdies, which are endemic to this type of rig.

Another point to question is the AIR-8's scanning. There's no resume scan feature. Most other scanners include resume scan after carrier or resume scan on time as standard features. However, the Sony is a throwback to the days when scanners had to be restarted manually. Hitting the + or − key on the front panel starts up the scanner until it gets to the next noise point.

And, speaking of those buttons, they are laid out on the front at an angle rather than being placed vertically or horizontally. I can't guess the ergonomic reasons for putting the execute (command) key in the upper right, the keypad slanted 10 or 15 degrees, and the other keys at various angles as well because I wasn't in on the design phase of this receiver. But I can say that it is a rather unusual layout, which is neither intuitive nor particularly easy to use. Restarting a scan requires a hunt for the key among five keys in the bottom of the front panel.

While I'm on the topic of the front panel, the liquid-crystal display is dim and hard to read in just about any light and at any angle. The best angle I came across during the review was about 45 degrees, which is the angle that's right for nearly all LCDs. The only problem that arose was that the hand-held scanner had to be kept at that angle, which defeats the purpose of this portable. At any other angle, you really couldn't see the readout. The green background light was unusable because it lit the display only to a low level.

The controls at the top were also interesting. You must remember to press on them to access the features because they are locking pushbuttons. The automatic squelch is a laudable feature; however, it makes the volume impossible to increase or decrease unless you remember to push the button.

To its credit, the Sony pocket scanner has very good audio rendition, which rivals full-sized scanners. The basses are rich and the highs are fairly full. The midrange is emphasized, but the top and bottom ends of the voice spectrum haven't been forgotten.

Further, each radio service that's covered has its own set of memories—10 per service—which is convenient as you move through the rather diverse set of services that are covered. The only problem with this is that the memory scan display consists of a barely visible little dot moving through a range of little dots on the right of the screen.

Finally, the antenna connector is a low-loss

BNC type, so insertion losses are minor and the AM antenna requires a separate miniature plug and can easily be confused with the earphone jack in the dark.

Perhaps the most troubling piece of this picture is the scanner's memory. It is totally volatile: If you take the power off it for more than a moment or two, there goes everything you've programmed.

This wouldn't be such a problem except for the fact that this scanner is a battery hog. A fairly fresh set of batteries gave out in less than six hours, and a new set in about eight. Replacing those batteries meant opening the cover and removing them. But, as the instruction book for this device states, removing the batteries for more than a minute or so wipes out the memory. So remember to be quick about battery changes if you buy this scanner.

This makes me ask why, in this day of nonvolatile RAM, Sony couldn't have included a capacitive charge which would have held memory for a long time, or why it couldn't have included a long-lasting small battery for memory retention. There is a NiCd pack available from Sony.

Altogether, then, if you're in the market for a hand-held scanner, take a look at the Uniden-Bearcat, Regency, or Radio Shack series. They are far more sensitive and meet the needs of the average amateur better. There seems to be a lot of potential in the AIR-8, but it certainly hasn't been realized yet, and I would urge you to wait until it is. Reader Service number 204.■

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Secrets of Silent Switching

Replace your big, noisy relays with tiny, quiet transistors.

Number 1 on your Feedback card

Since their early days, transistors have been used as switches in dc circuits. Back then, the only limitations were low power dissipation and low breakdown voltage. Now, high-voltage, high-wattage switching transistors are available at a fraction of the price of the old unreliable and now obsolete semiconductors.

While reviewing the basics of dc switching, I'll discuss the modification of an old Standard Horizon 2. Keep in mind that all procedures are applicable to any kind of transceiver, including tubed SSB models.

In the first part of this two-part article ("Make the Switch to PIN Diodes," October, 1986), I discussed the design of a new antenna switching circuit for the Horizon, using PIN diodes instead of relays. This time I will review the circuits used for 12-V-dc switching using semiconductor devices instead of mechanical units.

What Is a Switch?

Since we intend to switch, let's review some switching fundamentals. The ideal switch is one that will have infinite resistance when open and a zero contact resistance when closed. It should have no power dissipated within it, and drive power must not be necessary to hold the switch in either an on or off condition. In short, it must be 100% efficient! Yes, you're right, such a device doesn't exist. And if we try to replace that hypothetical switch with a transistor, things get even worse!

The transistor is one of the most inaccurate but most widely used electronic devices around. It is so inaccurate that most parameters show a minimum, a maximum, and a typical value. When used as a switch, a transistor is not as spectacular as a mechanical switch and is, in fact, far from ideal. Nevertheless, we can live with it if we are able to control its inherent deficiencies. We can take advantage of the options the transistor offers us and, after taming it, we can switch almost anything. To tame the beast, we must know how it works and a bit about its behavior.

There are two conditions that make a transistor useful as a switch. One is the switch-on condition or "saturation," and the other is the switch-off condition or "cut-off." During saturation—see Fig. 1(a)—the base-emitter junction is forward-biased and the emitter is pushing current into the collector through the base. Under this condition, the collector-emitter voltage is low, the result of a very low internal resistance (1 to 60 Ohms). This is the contact resistance of the switch, which ideally should be 0 Ohms.

For the common-emitter configuration shown in Fig. 1(b), the cut-off condition results when reverse bias is applied to the base-emitter junction; the emitter current is then nearly zero, except for a small inherent leakage current. For germanium transistors, it is necessary to apply a reverse bias because of large leakage current. For silicon transistors, this condition is met when the base bias is just zero.

The combination of both states in a single circuit is shown in Fig. 1(c). The forward and reverse bias is applied by connecting the base resistor either to the collector side to turn the switch on or to the emitter side to turn the switch off.

Transistor Specs

The most important parameters of a transistor are its breakdown voltage, maximum collector-emitter current, maximum power dissipation, beta value, and f_t limits. The breakdown voltage is the maximum permissible voltage that can be applied to the unit. The maximum collector-emitter current is the maximum current that can be switched. Maximum power dissipation in Watts is the maximum allowable current at a given voltage. Beta is the figure that reflects current amplification. F_t is the parameter that tells you the maximum frequency at which the transistor can be used with no performance degradation.

The power dissipation of a transistor is given by the sum of the base current times the base-to-emitter voltage, plus the collector current times the collector-to-emitter voltage. The power switched by a transistor is given by the product of the maximum collector voltage at cut-off and the maximum collector current at saturation. Always use a transistor with a power dissipation well above the power to be switched. Use Ohm's Law to check your circuit limits, remembering that the maximum collector current given by the manufacturer can often be exceeded without damage because at the time of switching the emitter-collector voltage is very low. On the other side, exceeding the breakdown voltage is *always* dangerous, as is exceeding the rated power dissipation.

With the simple circuit shown in Fig. 1(c) you can replace the relays in almost any radio. Some tricks are necessary to combine the simple normally open PTT switch with the solid-state SPDT switch needed to toggle the power source to the receiver and to the transmitter.

Switching the Transmitter +12 V Dc

Now, let's go into our business of switching. First I will analyze the circuits used in modern transceivers for switching +12 V dc in the transmitter. The first thing to determine is where to break the supply. Old equipment with relays used to change the +12-V-dc supply line between receiver and transmitter sections. This procedure does not apply for transistor switching since the total transmitter current would flow through the transistor. This makes very little difference for a relay; most relays used for switching are rated in the high-Amps category. In using switching transistors, though, it is important to know how much current will flow through them.

The way to overcome this limitation is to maintain the 12 V dc permanently in the high-level stages (PA, driver, pre-driver, and so on) and switch the dc pow-

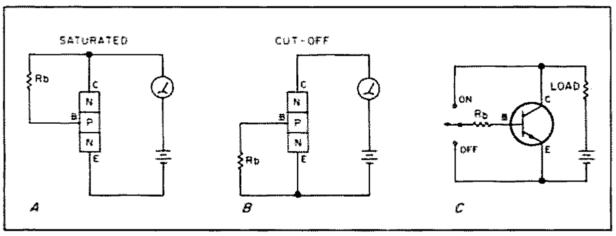

Fig. 1. Transistor saturation (a) and cut-off (b) make the device useful as a switch. The circuit in (c) is a simple way to switch a load on and off.

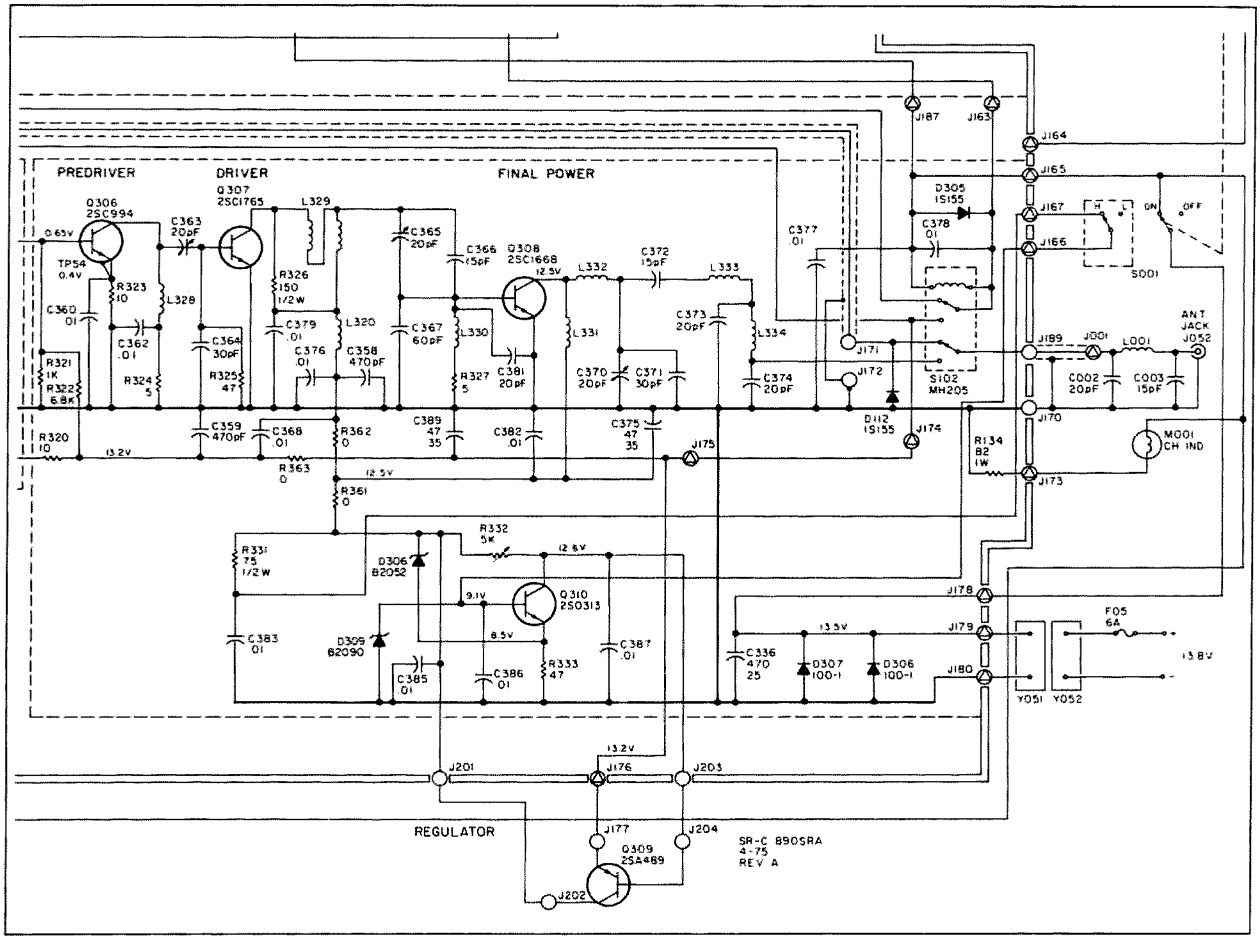

Fig. 2. An example of a radio which can easily be modified to solid-state switching.

er only at stages using less current. This way, the transistor used would be less costly and the dissipation requirements would be less restrictive.

To modify an older radio, it is very important to ensure that those stages that will have permanently applied 12 V dc will not self-oscillate. Otherwise, you run the risk of permanent spurious emission that may cause interference, yield a burned final transistor, or result in a call from the FCC monitoring station. That would be a smack in the eye!

Modern transmitters using better PA transistors and better designs are less prone to oscillation. This is *not* the case with old solid-state VHF and UHF transceivers! The easiest way to test the radio for self-oscillation is to press the mike PTT when you have a wattmeter installed at the output. Then, pull the crystal of the corresponding channel and watch for a drop in power. The power should go to *zero*. Sometimes the spurious emissions are as high as the normal rated power output for the radio! But be aware, and check for power on the order of milliwatts, too. The best procedure is to use a spectrum analyzer. Don't get discouraged if you don't have such an instrument—instead, a through-line wattmeter, swr meter, or rf voltmeter may be used.

Now, if no power is detected while the PTT is pressed, plug the crystal back in and try a few minutes of continuous operation on a dummy load in order to raise the temperature; then repeat the procedure. Be reasonable—do not bake the radio until it melts. Spurious emissions are very often caused by overheating in a poorly designed (or cheap) radio. A caution is in order: Some radios generate spurious signals due to poor design or misalignment, but this is not *always* the case. Occasionally a defective transistor or capacitor in a critical circuit may be the culprit. Don't overlook misalignment; use common sense and read the service manual.

It is important to recall that a transistor will drop some voltage due to its internal resistance. This is the most important consideration in selecting the transmitter stages that will be permanently connected to +12 V dc, for the higher the current demand, the higher the voltage drop. That's why I recommended that the switching be as far as possible from the PA stage—otherwise you will need a high-wattage transistor and a large heat sink.

Fig. 2 shows a portion of the diagram of a typical radio, like the one we are modifying. The relay breaks the transmitter +12-V-dc line when the radio is in receive mode. In this condition no power is applied to the transmitter stages. I have checked the Standard 890-L and found no oscillations or spurious emissions when the crystal is unplugged. This is

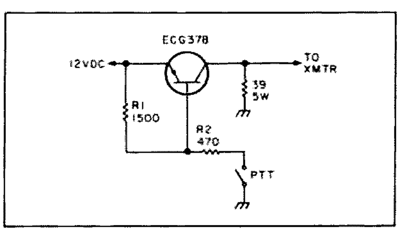

Fig. 3. Circuit for switching 12 V dc to the transmitter.

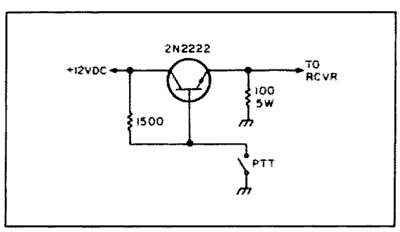

Fig. 4. Circuit for switching 12 V dc to the receiver section.

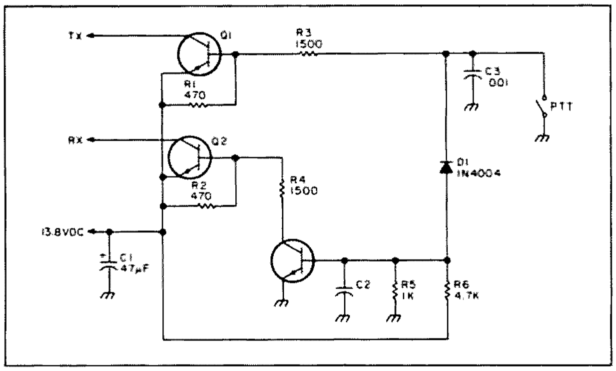

Fig. 5. Complete TX/RX voltage switching circuit.

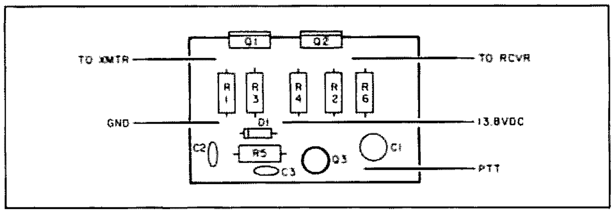

Fig. 6. Parts placement diagram for the switch.

not the case for older radios like the Standard model 803, which is very prone to self-oscillation.

I chose to permanently connect the +12-V-dc line to the PA, driver, and pre-driver stages, since the dc voltage regulator is not easy to switch. I then placed an ammeter in series with the line supplying 12 V dc to the remaining stages to check the current drawn by the rest of the transmitter section—and found it to be 0.115 A. Note: All stages that have a dc bias of zero may be permanently tied to 12 V dc. You may recognize such stages since their bases are connected through a coil or low-value resistor to ground.

A PNP transistor rated to 1 Amp would be a good choice. However, I selected an ECG-378 because it was already available. It has a dissipation of 50 Watts and is useful for a wide range of radio models without modifications. In this case, over-specifying is intentional and has very little effect on the cost.

In my radio, no heat sink was needed since the current involved was very low. The circuit in Fig. 3 shows an approach that may be used to switch from 5 volts to 60 volts at several Amps if a heat sink is used. Since the ECG-378 is a TO-220 packaged transistor, it will be no problem to affix it in any large metal surface within the radio.

You should use a separate heat sink if the switched current is more than 5 Amps. A caution is in order: Do not try to switch a higher current with this circuit unless a large drop in voltage is acceptable. Remember that a transistor is far from being an ideal switch due to its large internal resistance. If you need large-current switching, a different approach is necessary and is also out of the scope of this article.

The 1,500-Ohm and 470-Ohm resistors furnish the required base bias to Q1. The emitter is tied to the 13.8-V supply line, and the collector is tied to the line originally switched by the old relay. When the PTT switch is open, the transistor is at cut-off and no current will flow through the emitter-collector junction except for the leakage current.

Receiver Switching

For the receiver, follow the same procedure. Many modern radios do not switch the line supply for the audio PA; some sort of cut-off bias is applied when the radio is in transmit mode. If the audio PA is a typical transistorized stage, it may cause noise in the speaker if the transmitter is on and the audio stage has power applied. Thus, it is wise to make this test: Press the PTT switch, apply power to the audio PA, and listen carefully. If you have an oscilloscope at hand, use it to see if there are any oscillations or undesired effects in this stage while transmitting. If you don't have this instrument, use the older, more reliable one: the ear.

The total receiver current could easily be handled by any 50-Watt transistor, so do not worry too much about this unless your radio uses a really high power af amplifier or the IC manufacturer recommends not to switch the audio PA on and off. The Horizon 2 has an IC in the audio PA which is provided with a disabling bias. If your radio uses an IC for audio, chances are that the audio PA is provided with such cut-off facility, even if it isn't used. It is wise to check the IC specs or read the radio service manual to know how your radio works.

The circuit used in the receiver (see Fig. 4) is similar to the one used for transmitter switching. Check the receiver total current with the volume control at maximum. Using a milliammeter in series with the power source, I found 0.170 A of drain for the Standard 890-L. The transistor I chose is a 2N2222 NPN-type rated at 800 milliwatts, well above the current demand. The resistor is used to forward-bias the transistor that will be at cut-off condition when the PTT is pressed.

Another caution: Although I have defined the supply voltage as +12 V dc, remember that most radios are designed for 13.8 V dc. Use this figure when doing any calculations. Perhaps you would like to check the circuits using Ohm's Law. Very interesting things can be discovered.

Putting It Together

Fig. 5 shows the final circuit used for the modification. It is different from the previously reviewed circuits—although there are some similarities. Both transistors are PNP, and the receiver switch transistor is switched with the help of a popular NPN 2N2222A. I selected this combination to make things easier and, as a bonus, the same circuit may be used with different current drains of up to 50 Watts of dc power. Diode D1 is used to isolate both switches. The capacitors are used for decoupling. The transmitter switch is composed of Q1, R1, and R3. Q2 and Q3, along with R2, R4, R5, and R6, comprise the receiver switch.

Use a perforated PCB to assemble the circuit; place it wherever it is possible. Fig. 6 shows the layout with Q1 and Q2 mounted on the PCB. Q1 and Q2 may be fixed in an aluminum bracket or just against a chassis. Remember to use the insulating washer and mica with heat compound, for the flange is at positive dc voltage.

If the expected current is more than 5 Amps, use a heat sink. If you are switching some 500 mA, don't worry, for heat is of no concern. Check for noise, spurious emissions, or any abnormal function. Use capacitors for decoupling and common sense in routing the wiring.

If Q1 and Q2 are installed on the PCB, you have four wires. You may connect these wires at the holes left by the relay, with the ground wire soldered at any convenient place. Avoid placing the switching PCB near the rf PA circuit and associated tuned components. A 0.001-mF decoupling capacitor for the PTT may be necessary. Use a 4.7-mF tantalum cap in the receiver and transmitter switched lines. Now check the radio and enjoy your solid-state modern switching. Very soon you will forget what a relay click sounds like!

This same procedure may be used for HF radios and of course you may use some of the high-voltage transistors already available. There are transistors rated from 100 to 1,600 volts and up to 30 Amps. Don't forget to check the collector dissipation and don't go far from the specs. Even if the transistor is rated at a breakdown collector-base voltage of 1,100 volts and a collector current of 1 Amp with a collector dissipation of 40 Watts, *don't exceed the power dissipation.*

I modified 50 Standard 890-L units that had obsolete relays, and all are performing very well. Before undertaking any modification, you should get the service manual for your radio. Study the block diagram and the schematic and thoroughly plan the modification—before breaking the unit to pieces. Test the switch in a breadboard, watching for heat buildup, but remember that your radio is not designed for continuous operation. In any event, save the dismounted parts in order to replace them if anything goes wrong. If you are comfortable with a soldering iron but don't have modification skill, have somebody assist you. If you send me the schematics and enough information, I will assist you as much as I can, but please don't forget an SAE and enough IRCs for postage. ■

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PC Infernos

Don't toss that fried circuit board—in a couple hours the smoke will have cleared and your PCB will be working again.

Number 2 on your Feedback card

Lurking inside any complex electronic equipment is the potential for catastrophic failure, which can convert an expensive piece of equipment into so much junk. A friend of mine experienced this phenomenon recently when his two-meter rig developed a short and poured out billows of smoke. As this rig was mounted in an airplane he was piloting at the time, he became very excited very quickly. Safely back on solid ground, he sought my help.

Most good-quality radio equipment has at least one very expensive circuit board. A law credited to some fellow named Murphy warns us that failure is most likely to occur in that particular circuit board, and that when it happens it will probably be spectacular—as it was in this case. A shorted capacitor in the audio circuit burned several components and charred the circuit board so badly that repairing it seemed to be a hopeless task!

We all know that sometimes repair parts are not easy to come by, especially those that aren't normally replaced—such as an entire circuit board. If you do eventually find a source for the parts (not necessarily the dealer who sold you your fabulous radio), it could cost approximately an arm and a leg. Cost may not be the only deciding factor. Sometimes you do not have the time to wait for a replacement circuit board. Unless you can spare the price and time, a repair such as the one I employed could make your equipment operational.

As I considered the damage, it occurred to me that only the burned part of the board needed replacement. If a patch could be devised to replace this area, the original board could be used again. It would be necessary to make the patch fit securely and to etch the copper to match the original traces, but these would not be insurmountable difficulties.

Using a jeweler's saw with a fine blade, I cut away the burned area, taking care to cut in the most advantageous way. That is, if I noticed that most of a conducting trace had been removed, leaving only the solder pad, I was careful to cut away the solder pad as well. I then cut a matching patch for the damaged area from a piece of circuit board that was as nearly identical as possible to the original board. In order to achieve a snug fit, I cut the patch a bit large and filed it. The board and patch are illustrated in Fig. 1 and Photo A.

Since the patch was small and its foil pattern relatively simple, I decided to etch the patch by hand after securing it in place. Had it been more complicated, I would have etched the board by chemical means before securing it on the board.

When the patch fit snugly, I glued it into place using epoxy. The pieces were clamped and allowed to dry overnight so there would be no danger of them shifting during the rest of the patching operation. In the meantime, I studied service literature and the burned piece to try to reproduce the pattern of the traces. Happily, I found an identical transceiver, so I could copy the board layout in rebuilding the patched board.

Using dividers, a ruler, and other equipment, I marked and drilled component holes in the patched area to match the original component placement. Using these holes as points of reference, I drew in the lines for the conductor tracks, ensuring that they joined the existing tracks at the border of the patch. Etching was accomplished by simply cutting away the unwanted copper foil using a small knife.

With the finished patch in place, I bridged the breaks in all the traces where they crossed the border of the patch, soldering fine wire jumpers across the cuts. The components were then installed, replacing the burned ones, and the board was ready to be returned to service. The patch was distinguishable only because the original board had a protective coating that made it a darker green.

The repair of this circuit board required only a few hours, spread over a couple of days. It required far less time than would have been needed to obtain a replacement board. Also, it cost considerably less, yet it seems to operate as well as a new board. Thanks to the interlocking construction, it is virtually as strong as the original. I have found the repair to be very satisfactory, and this procedure has given me one more way to deal with burned circuit boards. ■

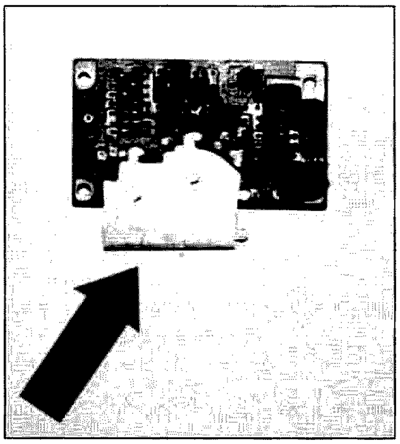


Photo A. The patch ready to be inserted.

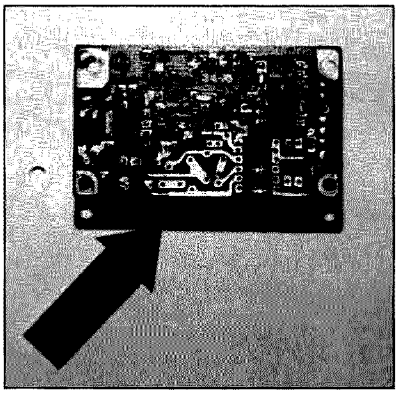


Photo B. The repaired board.

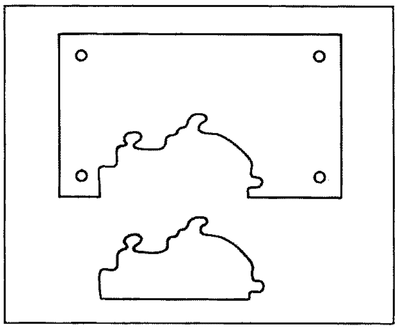
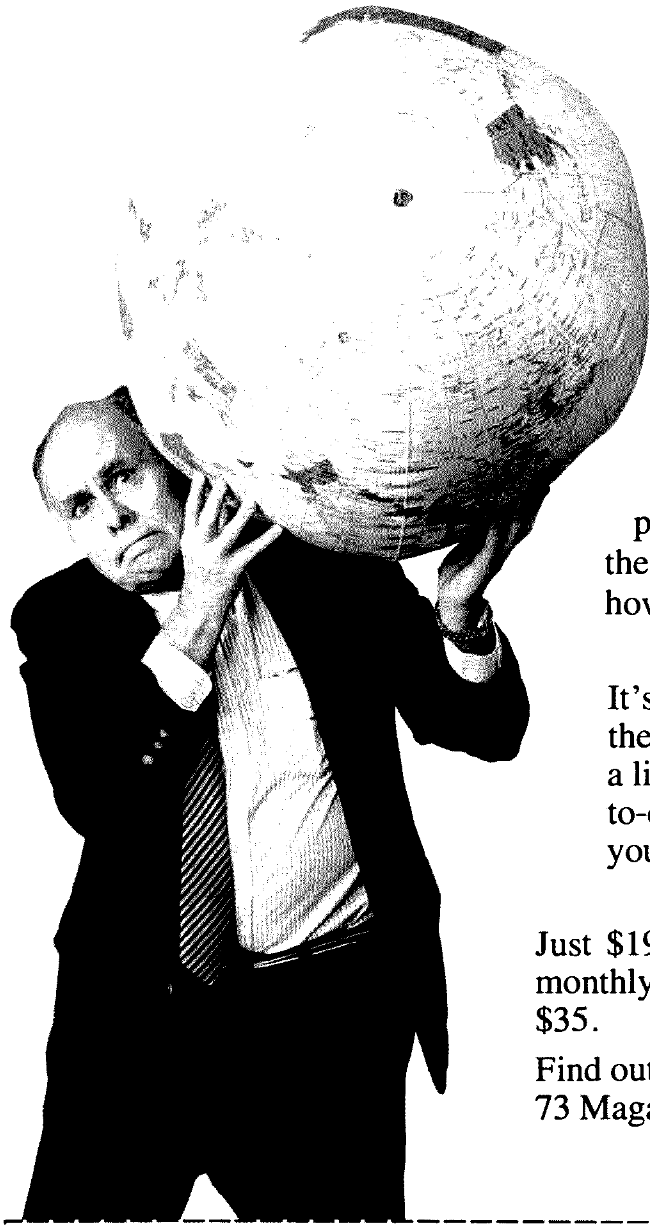
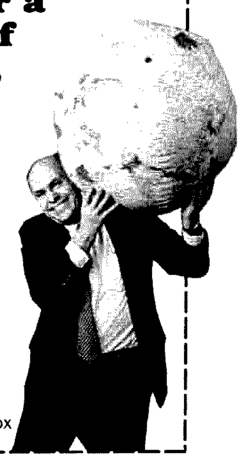


Fig. 1. Patch for a damaged circuit board.





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Shoestring Software

This no-frills C-64/VIC-20 RTTY program will give you 45 baud on a budget.

Number 3 on your Feedback card

Since my article "Shoestring RTTY" appeared in the January, 1985, issue of *73*, I have had inquiries from hams who are interested in writing their own software in addition to building their own interface.

I set out to write a short program that could be typed into a Commodore 64 or VIC-20 computer easily, and one that would provide transmit and receive RTTY operation. The resulting software doesn't have a lot of frills, such as a split-screen display and a type-ahead message buffer, but it does have message strings, T-R switching, and two-speed (60- and 100-wpm) operation. It will work with any interface, commercial or home-brew.

How It Works

Since all computers are designed to interface with the outside world (usually through telephone lines), most of the communication software is already built into the operating system. On Commodore machines, just one OPEN statement sets the baud rate, number of bits in a word, parity, simplex or duplex, and other parameters. There are two 256-character buffers which store information received and information to be sent.

The language used by all computers is ASCII, and there are many standard baud rates—110, 300, and 1200 baud being the most common. The ASCII word is usually eight bits long. If RTTY communication used, say, 300-baud ASCII, then writing a terminal program would be almost trivial. However, the language used is Baudot, and most ham communication is at such non-standard baud rates as 45 and 74 baud, usually called 60 and 100 wpm, respectively.

Each Baudot character is represented by five bits of information, allowing only 31 possibilities (not 32, because there is no character containing all zeros). A shift command, however, allows each five-bit word to have two meanings, thus providing a total of 62 possible characters.

In order to make a computer—which understands only ASCII—send and receive Baudot, it is necessary to translate the information both coming in and going out.

There are several methods of translating between codes. The one used here stores ASCII values in an array of variables. The received Baudot code appears to the computer to be five-bit ASCII, so the ASCII value will be between 1 and 31. This number points to a particular element of the array, which is the real ASCII value of that character. The character then appears on the screen. Likewise, pressing a particular key causes the five least significant bits of an ASCII character to be sent, which will appear to the receiving station as the correct Baudot character.

It is also necessary to set the computer to the right baud rate for RTTY. On Commodore machines, any baud rate can be obtained by setting two RAM locations (665 and 666) to the correct bit time for that baud rate. The program, as written, provides the two most commonly used baud rates, 45 and 74. If you wish to experiment with different baud rates, change the following program lines:

```
380 PRINT:INPUT "BAUD RATE";BR:R=INT
    (1.023E6/BR+.5):Q=INT(R/256)
```

and

```
381 POKE 665,256*(R/256-Q):POKE 666,Q:
    RETURN
```

All the program commands are handled by the function keys (see Table 1). Pre-defined messages are sent by pressing keys F1 through F6; each key accesses a subroutine containing the appropriate message.

The first subroutine (corresponding to F1) begins at line 410, the second (corresponding to F2) at 420, and so on, up to F6 at 460. Transmit/receive switching is controlled by F7, and F8 changes speed. Both F7 and F8 are toggles; that is, each time the key is pressed, the opposite action occurs. Pressing F7 when in the receive mode switches to transmit and vice versa.

Incidentally, the program does not allow a switch from transmit to receive until everything in the transmit buffer has been sent. The computer will print STILL SENDING and will switch to receive as soon as the transmission has been completed.

Typing the Program

Extra spaces and remark statements have been placed in the listing for increased readability and as a guide to understanding the function of each part of the program. Leaving out the REM lines and the extra spaces will save time (and memory, important if you are using an unexpanded VIC).

I have a daisy-wheel printer, so it may be a little difficult to tell the difference between a zero and a letter O. Just remember that O's appear only in words and Basic keywords; everything else is a zero.

Customize the message strings as you go through that part of the program. Insert your own call, name, QTH, equipment, etc. Message strings of up to 256 characters

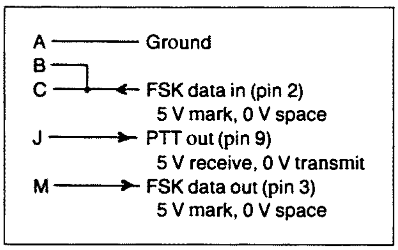


Fig. 1. Computer-interface connections. Numbers in parentheses refer to pin numbers of U3 (Fig. 3).

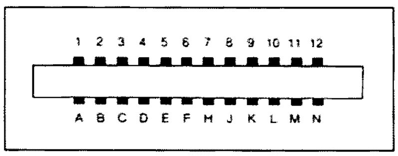


Fig. 2. User I/O port, rear view.

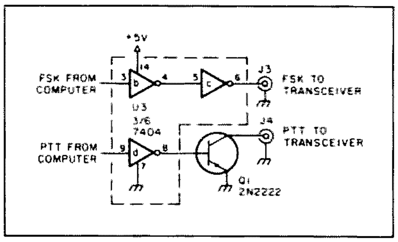


Fig. 3. U3.

can be created by linking program lines together. Lines 460 and 461 show an example of this. Lines 450 and 451 demonstrate how a line can be repeated. The "CQ...DE callsign..." string is repeated three times followed by "K K." After the final statement defining each message string, don't forget to add ":RETURN" to complete the subroutine.

The program listing is for the Commodore 64. For the VIC-20, change the following lines:

```
20 POKE 37138,32:POKE 37136,32
370 IF T=0 THEN POKE 37136,0:T=1:PRINT:PRINT
    "TRANSMIT MODE":RETURN
371 S=0:FOR I=1 TO 8:S=(PEEK(37148)-238) OR
    S:NEXT
372 IF S*T THEN PRINT:PRINT "STILL
    SENDING":T=0
373 IF S THEN 371
374 POKE 37136,32:PRINT:PRINT "RECEIVE
    MODE":T=0:RETURN
```

If your VIC has no memory expansion, keep all the message strings short and omit lines 451 and 471.

When you have finished typing in the program, make a copy to tape or disk before running it. You can check it out off the air by connecting pins B, C, and M of the user I/O port together. Switch to transmit mode, send up to 256 characters, then switch back to receive. The receive buffer will be emptied to the screen, and you should see exactly what you typed in or sent with the function key messages. If there is a discrepancy in a particular character, that means there is an error in one of the DATA statements.

Once everything is working off the air, you are ready to connect the interface to the appropriate pins on the user port, which will require a 12/24 card edge connector. See Fig. 1. (A good source for this connector is Jameco Electronics, 1355 Shoreway Road, Belmont CA 94002.) Note that all connections are made on the bottom side of the connector. It is a good idea to mark the top of the connector, since it is possible to insert it either way. The computer or the interface could possibly be damaged by upside-down insertion.

The only thing left to do now is to get on the air and start enjoying RTTY. ■

Key	Function
F1	Send RY string
F2	Send name and QTH
F3	Send DE callsign and name
F4	Send rig info
F5	Send CQ
F6	Send computer info
F7	T-R switch
F8	Change speed

Table 1. Function key commands.

```
0 REM
1 REM  ****************************
2 REM  *                          *
3 REM  * SHOESTRING RTTY SOFTWARE *
4 REM  *      FOR COMMODORE 64    *
5 REM  *  BY DAVID OLIVER  W9ODK  *
6 REM  *                          *
7 REM  ****************************
8 REM
9 REM
10 OPEN 2,2,0,CHR$(101)+CHR$(16)
20 POKE 56579,32:POKE 56577,32
30 FL=1:M=0:T=0
40 DIM RC(64),TC(64):RESTORE
50 FOR I=1TO62:READ RC(I):NEXT
60 FOR I=1TO60:READ TC(I):NEXT
70 PRINT CHR$(147)CHR$(17)"RECEIVE MODE"
:GOSUB 380
80 GETA$:IF A$="" THEN 100
90 IF ASC(A$) > 132 AND ASC(A$) < 141 THEN
 400
100 IF T=0 THEN 300
110 IF M=0 THEN 150
120 FOR I=1 TO M :A$=MID$(M$,I,1):IF I=M
 THEN M=0
130 GETZ$:IF Z$=CHR$(13)THEN M=0:GOTO 80
140 REM    SEND ROUTINE
150 IF A$="" THEN 270
160 PRINTA$;
190 A=ASC(A$)
200 IF A=13 THEN A=91
210 IF A=32 THEN A=92
220 IF A<33 OR A>92 THEN 270
230 A=A-32:IF A<33 THEN PRINT#2,CHR$(91)
+CHR$(TC(A))+CHR$(95);:GOTO 270
250 PRINT#2,CHR$(TC(A));
270 IF M THEN NEXT
280 GOTO 80
285 REM
290 REM    RECEIVE ROUTINE
300 GET#2,B$:IF B$="" THEN 80
310 B=ASC(B$):IF B<1 OR B>31 THEN 80
320 IF FL THEN B$=CHR$(RC(B)):GOTO 340
330 B$=CHR$(RC(B+31))
340 IF FL AND (B=27) THEN FL=0:GOTO 80
345 IF B=31 THEN FL=1:GOTO 80
350 PRINTB$;:GOTO 80
360 REM     T/R SWITCHING
370 IF T=0 THEN POKE 56577,0:T=1:PRINT:
PRINT"TRANSMIT MODE":RETURN
371 IF PEEK(673) AND 1 THEN PRINT:PRINT
"STILL SENDING"
372 IF PEEK(673) AND 1 THEN 372
373 POKE 56577,32:PRINT:PRINT"RECEIVE MO
DE":T=0:RETURN
374 REM
375 REM     HI/LO BAUD RATE
380 IF PEEK(665)=236 THEN POKE 665,72:PO
KE 666,53:PRINT:PRINT"100 WPM":RETURN
381 POKE 665,236:POKE 666,87:PRINT:PRINT
"60 WPM":RETURN
400 M$="":ON ASC(A$)-132 GOSUB 410,430,
 450,370,420,440,460,380
401 M=LEN(M$)*T:GOTO 100
404 REM
405 REM     MESSAGE STRINGS
410 M$="RYRYRYRYRYRYRYRYRYRYRYRYRYRYRYRY
RYRYRYRY ":RETURN
420 M$="NAME IS DAVE DAVE. QTH IS SHEVLI
N, MN SHEVLIN, MN. ":RETURN
430 M$="DE W9ODK... DAVE... IN NORTHERN
MN. ":RETURN
440 M$="RIG IS IC720A WITH CLIPPERTON-L
PUTTING OUT ABOUT 500 W. ":RETURN
450 M$="CQ CQ CQ CQ CQ DE W9ODK W9ODK W9
ODK  "
451 M$=M$+M$+M$+"K K ":RETURN
460 M$="USING COMMODORE 64 COMPUTER WITH
 INTERFACE AND SOFTWARE OF MY "
461 M$=M$+"OWN DESIGN. ":RETURN
485 REM
490 REM   DATA FOR CONVERSION ARRAYS
500 DATA 69,10,65,32,83,73,85,13,68,82
505 DATA 74,78,70,67,75,84,90,76,87,72
510 DATA 89,80,81,79,66,71,23,77,88,86
515 DATA 23,51,10,45,32,39,56,55,13,36
520 DATA 52,39,44,33,58,40,53,34,41,50
525 DATA 35,54,48,49,57,63,38,42,46,47
530 DATA 59,23,77,81,84,73,68,90,69,79
535 DATA 82,91,68,76,67,92,93,86,87,83
540 DATA 65,74,80,85,71,70,88,78,94,68
545 DATA 68,68,89,68,67,89,78,73,65,77
550 DATA 90,84,70,75,79,82,92,76,88,86
555 DATA 87,74,69,80,71,94,83,93,85,81
560 DATA 72,68
```

Program listing. "Shoestring RTTY" software for the C-64 (see text for modifications for the VIC-20).

Jim Grubbs K9EI
PO Box 3042
Springfield IL 62708

The Talking Teletype

Put your VIC-20 or C-64 to work chatting away in the shack with this Basic RTTY-to-voice program.

Number 4 on your Feedback card

The computer is a great tool for the handicapped. A large contingent of hearing-impaired individuals use their computers for TDD operation over the phone lines.[1] Comvoice, a recent offering by Genesis Corporation (PO Box 152, Hellertown PA 18055), made bells go off in my head suggesting additional ways that computers could be used to open up new avenues for another group of individuals—those with vision impairments.

The Comvoice program looks like a game cartridge and plugs into the expansion port on Commodore computers. A version is available for both the C-64 and the VIC-20. It is a Votrax-based speech-synthesizer unit with the typical mechanical-sounding voice. In most applications, though, the speech is more than clear enough to be easily understood.

What sets the Comvoice unit apart from other voice synthesizers is that it does not interfere with normal RS-232 operations. The RS-232 user port—where the modem normally connects to the computer—is the easiest access point for sending and receiving serial information like Teletype® signals.

Since many synthesizers tie up the user port, modem or Teletype operation is not possible. Software synthesizers that take advantage of the sound capabilities of the C-64 usually corrupt the hardware interrupts so that the machine is no longer easily usable for RS-232 functions. Comvoice has none of these problems.

RTTY Meets Computer—The Basics

Computers like to speak ASCII code. RTTY, however, uses Baudot, a five-bit code allowing for little more than the alphabet, numbers, and a few punctuation marks. ASCII, with its seven bits, can distinguish between upper- and lowercase and has an expanded set of characters. Commodore ASCII (and others) adds one more bit (for a total of eight), allowing a set of graphics characters as well.

Through software control, it is very easy to instruct the Commodore user port to look for

```
100 goto 360
110 poke 665,r:poke 666,q:
120 pt=56579:rem value for c-64
130 rem for vic-20 pt=37138
140 ls=-1
150 lf$=chr$(10)
160 cr$=chr$(13)
170 l$="e"+lf$+"a siu"+cr$+"drjnfcktzl*hypqobg*mxv*"
180 f$="3"+lf$+"- '87"+cr$+"$4',!:(5')2#60197&*./;*"
190 get#2,c$:if c$="" then 260
200 c=asc(c$):if c<1 or c>31 then 190
210 if ls then c$=mid$(l$,c,1)
220 if not ls then c$=mid$(f$,c,1)
230 if us$="y" and c$=" " then ls=-1:rem usos
240 if c$<>"*" then print c$;:gosub 780:goto270
250 ls=(c=31)
260 get a$:if a$="" then 190
270 if a$="l" then ls=-1
280 if a$=chr$(95) then close 2:goto 360
290 if a$="f" then ls=0
300 if a$=chr$(135) then v=2:speak "letter mode on"
310 if a$=chr$(136) then v=1:speak "voice on"
320 if a$=chr$(140) then v=0:speak "voice off"
330 if a$=chr$(133) then goto 580
340 a$=""
350 goto 190
360 open 2,2,0,chr$(96+1)+chr$(0)
370 us$="y":print chr$(147)+chr$(17)+chr$(17);"usos (y/n)"
380 speak "do you want un shift on space answer y or n"
390 input us$
400 br=60:print chr$(147)+chr$(17)+chr$(17);
405 br=60:print "what speed":print "(60,67,75,100 wpm)"
410 speak "what speed"
420 input br
430 gosub 510
440 print chr$(147);" 73 talking rtty rx":print str$(br)+" wpm"
450 speak "73 talking r t t y receive"
460 br$=str$(br):speak br$:speak "words per minute"
470 if us$="y" then print chr$(19)+chr$(17)+chr$(17);" usos on"
480 if us$="y" then:speak "un shift on space on"
490 print
500 goto 110
510 d=1.023e6
520 if br=60 then b=45.45
530 if br=67 then b=50
540 if br=75 then b=56.92
550 if br=100 then b=75
560 x=int(d/b+.5):q=int(x/256):r=256*(x/256-q)
570 return
580 print chr$(147)+chr$(18);" 73 talking rtty tx ":poke pt,32
590 speak "73 talking r t t y transmit"
600 l1$="cyniamztfkor|lxvwjepgs]uq"
610 f1$="mdtidzqorddlc|]vwsajpugfxndddyd"
620 get x$:if x$=""then goto 620
630 if asc(x$)>47 and asc(x$)<58 and v<>0 then:speak x$
640 if asc(x$)>64 and asc(x$)<91 and v<>0 then:speak x$
650 if x$=chr$(34)then x$=chr$(39)
660 if x$=chr$(133) then poke pt,0:a$="":goto 440
```

Basic program to drive the Comvoice speech unit.

serial data in many configurations. The number of data bits as well as stop bits can be specified by the program. With the word length set to five bits, the computer still speaks ASCII, but only pays attention to the first five bits. Through use of a translation table, the computer can be made to print the intended Baudot character, though internally the machine continues to speak ASCII. See the programmer's reference guide for more details about OPENing an RS-232 channel.

Most amateur RTTY takes place at 60 words per minute. Computer types more accurately refer to this as 45.45 baud, which is not a standard baud rate on Commodore computers. But, there are a pair of magic registers that when POKEd to the right values can make the machine operate at any baud rate within its speed limits. Such a routine is included in my program, which also allows for reception of all standard amateur RTTY speeds.

For transmitting, the process is similar but the translation is reversed. When you press a key, the program looks up that key in a table to find what ASCII code "looks like" the Baudot character you wish to send. The result is transmitted to the user port.

The Miracle of Speech

Up to now, I haven't done anything particularly special to make this a talking Teletype program. The changes necessary, though, are minimal due to the way Comvoice implements speech.

With Comvoice in place, an additional Basic command is added. SPEAK does exactly what you would think and is used much like a PRINT statement. By simply adding several SPEAK commands to the existing PRINT commands, you can make the Teletype program come to life with voice. It's here where a few problems begin, most of which are easy to overcome.

First of all, many of us would prefer that our computer speak in whole words rather than in individual letters. When you use the SPEAK command, though, you get individual letters. By buffering the incoming data and building a string variable from the individual letters, you can construct words. The program is designed to trigger speech when a space is received, since words are separated by spaces.

This procedure goes along fine until somebody starts sending something that isn't really a word. Abbreviations can be a big bugaboo. Comvoice will attempt to pronounce them as long as they contain no numbers or "illegal" punctuation. If they do, the program crashes.

The first addition I made to the program, therefore, was to add a subroutine to screen the data. When something other than a letter is received, the speaking part of the program simply ignores it, turning the characters into spaces. This keeps the program from crashing.

Next, the problem of callsigns had to be overcome with another subroutine. After all, it doesn't do much good if you can't figure out whom you are talking to. When the subroutine encounters a string that contains a number, the program automatically shifts into pronouncing each individual letter and number. This is done until another space is encountered, at which point normal word mode is reinstated.

My solution to dealing with the many abbreviations used in amateur transmission was to create a look-up table for the more common ones. This actually works quite well, but slows down the program. My list is by no means complete, but it can be expanded or changed to suit your own needs.

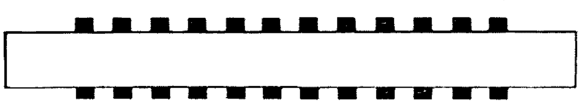
```
670 print x$;
680 if x$=chr$(13) then print#2,"h";:goto 620
690 if x$=chr$(10)then print#2,"b";:goto 620
700 if x$=chr$(32)then  print#2,"d";:goto 620
710 x=asc(x$)
720 if x<33 then goto 620
    print#2,x$+chr$(95);:goto 620
730 if x<65 then x=x-32:x$=chr$(91)+mid$(f1$,x,1):
740 if x>95 then goto 620
750 x=x-64:x$=mid$(l1$,x,1)
760 print#2,x$;
770 goto 620
780 if v=0 then return
790 if v=4 and c$<>" "then goto 810
800 if v=4 and c$=" " then v=1:return
810 if v=2 or v=4 then:if asc(c$)<48 or asc(c$)>90 then c$=" "
820 if v=2 or v=4  then:if asc(c$)>57 and asc(c$)<65 then c$=" "
830 if v=2 or v=4  then:speak c$:return
840 if asc(c$)>90 or asc(c$)<48 then c$=" "
850 if asc(c$)>47andasc(c$)<58then:gosub 1130:v=4:sa$="":speak c$:return
860 if asc(c$)>57 and asc(c$)<65 then c$=" "
870 sa$=sa$+c$:if c$=" "then gosub 920:goto890:if v=4 then v=1
880 return
890 speak sa$
900 sa$=""
910 return
920 if sa$="wx " then:sa$="whether"
930 if sa$="pse " then:sa$="please"
940 if sa$="rst " then:sa$="r s t"
950 if sa$="cul " then:sa$="see you later"
960 if sa$="qth " then:sa$="q t h"
970 if sa$="nw " then:sa$="now"
980 if sa$="qsl " then:sa$="q s l"
990 if sa$="qrn " then:sa$="q r n"
1000 if sa$="ok " then:sa$="o k"
1010 if sa$="qrm " then:sa$="q r m"
1020 if sa$="de " then:sa$="this is"
1030 if sa$="qsb " then:sa$="q s b"
1040 if sa$="mso " then:sa$="m s o"
1050 if sa$="ft " then:sa$="feet"
1060 if sa$="cq " then:sa$="c q"
1070 if sa$="khz " then:sa$="kilohertz"
1080 if sa$="b4 " then:sa$="before"
1090 if sa$="gn " then:sa$="good night"
1100 if sa$="gm " then:sa$="good morning"
1110 if sa$="qrt " then:sa$="q r t"
1120 return
1130 for b=1 to len(sa$)
1140 s$=mid$(sa$,b,1)
1150 speak s$
1160 next
1170 return
1180 rem *******************
1190 rem *   talking rtty  *
1200 rem *  copyright 1985 *
1210 rem *  by jim grubbs  *
1220 rem *   po box 3042   *
1230 rem *  springfield il *
1240 rem *    62708 usa    *
1250 rem *******************
```

Variations on a Theme

It is also possible to create a subroutine that scans for all strings three characters long that begin with "Q." This would enable the program to recognize Q signals and pronounce them correctly, and would work in a similar fashion to the callsign routine in lines 1130 through 1170.

In the final version, I decided that it would be nice to have both word and individual letter modes available. They are implemented using the function keys. The F7 key turns the voice on; F8 turns it off. A touch of the F5 key places the program into the individual character mode. For accuracy, any time the voice is turned on, the individual character mode echoes the transmitted data that the operator is keying in. F1 toggles the program between receive and send. You can change the unshift-on-space and speed options by pressing the back-arrow key, located in the upper left-hand corner of the keyboard, while in receive.

Under most operations (particularly at 60 wpm) with most typists, this Basic program has no trouble keeping up with what is going on. When full-tilt text is being sent by tape or from someone's buffer, the time involved for speaking will make the program lag behind the actual transmitted text. The Commodore has a built-in 256-character buffer, so until that overflows nothing will be lost. A more complex program could allow the in-



PIN #	TYPE	NOTE	PIN #	TYPE	NOTE
1	GND		A	GND	
2	+5V	100mA MAX.	B	CB1	
3	$\overline{\text{RESET}}$		C	PB0	
4	JOY0		D	PB1	
5	JOY1		E	PB2	
6	JOY2		F	PB3	
7	LIGHT PEN		H	PB4	
8	CASSETTE SWITCH		J	PB5	
9	SERIAL ATN IN		K	PB6	
10	+9V	100mA MAX.	L	PB7	
11	+9V		M	CB2	
12	GND		N	GND	

Fig. 1. Connections to Commodore computer user port.

coming text to be buffered even further. I've tried the C-64 version of this program after compiling it using Blitz! and that helps overcome some of the speed problems. This may be the way to go if you want a long table of abbreviations.

Using Your Mind's Eye

It doesn't take much imagination to see a lot of other uses for a speech synthesizer in the blind ham's shack. With a bit of effort, a main program could be created to allow transmitter and receiver tuning by speaking the values. Once they have been tuned, you could select the desired mode. Even individuals with severe speech problems might be able to operate voice for the first time by typing comments on the keyboard and having the output of Comvoice directed to the transceiver. Think what will happen when speech recognition becomes available in the same price range!

I've even played with a program that could be used for contest operation, which has Comvoice calling CQ. You input the call of the answering station or the station you wish to answer. By pushing the right function keys, you can have the entire contest exchange spoken for you. Repeats and auto serial numbering are allowed for. The program contains a clock, so you can log the contacts from the same program. A dupe routine alerts you to stations you have worked before. I'm not quite sure how I would feel working a computer on Field Day or in the Sweepstakes, but the concept is fun anyway. Anybody want to see that one?

It's a Wrap!

The necessary connections to interface the computer to just about any standard terminal unit are included in Fig. 1. The program works equally well on both the VIC-20 and C-64, but keep in mind that it will work only with the Comvoice speech unit.

If you would like a copy of the program on disk or tape (be sure to specify which one), I'll be happy to supply one for $10. Send requests to QSKY Publishing, PO Box 3042, Springfield IL 62708. Sorry, time doesn't allow me to design individual programs or applications hardware. ■

Reference

1. The TDD system was invented by Bob Weitbrecht, a deaf amateur, using the Baudot code. For more information, refer to K9EI's article in TRANSACTOR magazine, volume 6, number 1.

Ralph E. Taggart WB8DQT
602 S. Jefferson
Mason MI 48854

Micro Morse

This universal CW interface bridges the gap between your rig and your computer.

Number 5 on your Feedback card

There is little doubt that the microelectronics revolution has had a profound effect on CW. First came simple keyers, followed by memory keyers, keyboards, code readers, and now full-function Morse terminals. Although many fine CW/RTTY terminals are available, a microcomputer-based system is attractive in that the computer can be used for many other purposes as well, helping to justify the cost of the system.

Vendors such as AEA and Kantronics offer a full line of software and hardware interfaces that will provide full CW/RTTY operation with a variety of home computers, including those made by Tandy, Apple, Commodore, Atari, and IBM. Assuming you have the computer on hand, you can be off and running for less than $250 for the software and the interface unit.

You can always trust the dedicated ham to try to cut corners, so I sat back waiting for some magazine to publish a suitable software article for operation with my Color Computer. Along came a program in the December, 1982, issue of *80 Micro* by Michael Chuck. This is a full-feature package for the CoCo, offering speed autotrack on receive, keyboard-select of transmit speed, multiple memory buffers, and provisions for machine storage of contact data—in short, almost anything you might need in a CW terminal.

About the only thing missing from Mike's fine article was a decent interface circuit. The design presented was a simple audio-operated switch sufficient to demonstrate the potential of the program, but too deficient for serious operation on the HF bands.

Anxious to put the program to work in my New Year's quest for WAS using QRP, I set out to design a general-purpose interface unit that could be used with any software/computer system and that would work with almost any HF equipment. The project was reasonably successful and along the way I learned quite a bit about machine-processed CW! The purpose of this article is to pass along some of these observations as well as a simple but practical interface design.

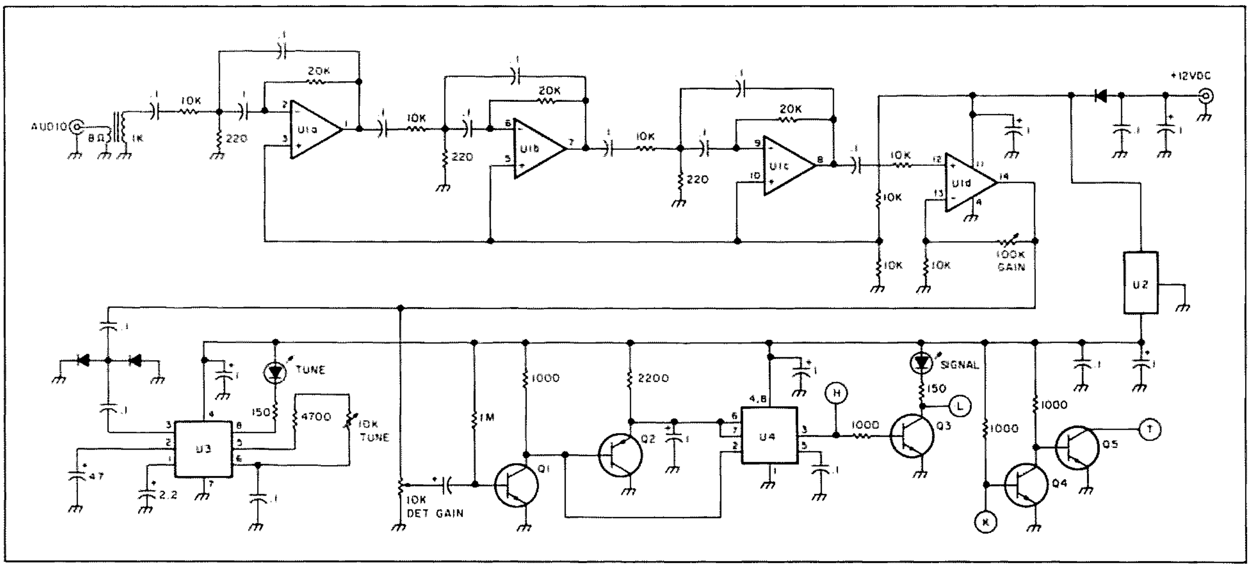


Fig. 1. Schematic diagram of the CW/computer interface. U1 is an LM-324N quad op amp, U2 is a 7805 (LM340T-5) voltage regulator, U3 is an NE567 tone decoder, and U4 is an NE555V timer chip. Q1, Q3, Q4, and Q5 are general-purpose NPN transistors such as the 2N4401, while Q2 is a general-purpose PNP (2N4403 or equivalent). Unmarked diodes are general-purpose silicon (1N4004), while the indicator LEDs can be virtually any LED. All resistors are 1/4 W, 5% composition. The 100k gain pot is a standard panel-mounting pot (linear taper), while the detector gain pot is a PC-mounted linear trimmer. All capacitors are in uF; non-polarized units are mylar™, while polarized units are dipped tantalums (16 V minimum). The input transformer is a subminiature 1k. An 8-Ohm unit is available off the rack at Radio Shack.

Design Considerations

The attributes of the ideal CW interface are easy to define. The unit should be compatible with all code speeds up to blue light, capable of decoding signals at or below the noise level, and immune to QRM! Unfortunately, a reasonably simple interface circuit cannot be expected to have all of these sterling features. What you will get with a reasonable parts count is as follows:

- The unit is capable of copy at extremely high speeds—certainly up to 60 wpm. I know it will deliver good copy at speeds where letters are virtually indistinguishable and even where word groups are difficult to discern.
- The performance in noise depends on the type of noise you must contend with. A relatively constant white-noise level is no problem, but loud static bursts or pulse-type noise will cause copy errors if the signal-to-noise ratio is unfavorable.
- With SSB receiving filters, the interface is highly effective in the presence of even heavy QRM as long as it doesn't desense the receiver to the point where the desired signal drops out. With CW i-f filters, I would say the interface is almost uncrunchable, delivering solid copy at the low end of 20 in the midst of a contest!

Although the receiving side of any interface circuit is by far the most critical, the transmitting side has not been neglected in this design. Most CW transmit routines for home computers use the cassette recorder motor-control relay for CW keying. If your rig has a solid-state keying-control circuit, this will present few problems. You can put some mileage on the relay if you try to key higher currents or voltages. The interface incorporates a keying-control circuit to minimize relay wear. Provisions are included for keying the transmitter with either a transistor switch or a small relay.

All of the various circuit ideas incorporated into the interface will be described fairly completely. This is not to make the circuit easier to duplicate—you could really do that knowing very little about how it works—but rather to give you some ideas for your own experiments if you want to start playing with interface hardware options.

It is a deceptively simple subject that quickly deepens once you start to play with real-world trade-offs. Finding out why some ideas don't work or why others work very well can be a fascinating pastime that doesn't consume a lot of money or require hard-to-get parts. Follow along and see how I did it, and then take off on your own if you are so inclined! The complete interface schematic in Fig. 1 will serve as the primary reference for the sections that follow.

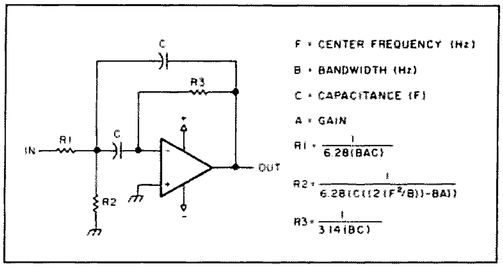


Fig. 2. Layout and design equations for a single-stage active-bandpass filter. Three such stages are used in the interface circuit.

Audio Filters

The first question that might be asked is why bother with audio filters? If your rig incorporates narrow CW i-f filtering, extensive audio filtering will not make a major difference in performance—though it will help a bit.

Unfortunately, virtually all of the high-class transceivers on the market, while sporting excellent SSB filters, always have the CW filter as an "option." Since the option costs money, all too many operators end up using SSB filters with Morse and then wonder why it is not as much fun as the dedicated CW friends say it is. In such cases, some effective audio filtering can make CW a pleasure.

At the far end of the scale in receiver design are the direct-conversion jobs that have appeared over the years as companions to QRP rigs. Although CW is the primary mode, to judge by the companion transmitters, these receivers tend to have only SSB-bandwidth audio filtering and desperately need all the CW filtering they can get.

One of the simplest approaches to audio filtering is the multiple-feedback, active-bandpass filter (illustrated in Fig. 2). Here, a single op-amp stage can be wired as an audio-bandpass filter with a defined set of characteristics.

Assuming a constant value for the capacitors in the filter circuit (C), filter performance is set by three resistors. The input resistor (R1) sets the stage gain, the shunt resistor (R2) sets the center frequency of the filter, and the feedback resistor (R3) sets the bandwidth. The design formulas for these resistors are shown along with the diagram in Fig. 2.

The design of a suitable filter stage involves selecting appropriate performance parameters and calculating the resistor values for the filter. That is simple enough, so what do we want as performance targets in terms of center frequency, bandwidth, and gain?

Ideally, the filter center frequency should match the peak audio output of the receiver in the CW mode, which in turn should correspond to the proper receiver offset for transmitter zero beat. In most modern gear this is about 750 Hz.

Bandwidth is a more complicated problem. Narrow bandwidths, short of the point where excessive ringing is produced, can minimize QRM but can also present a number of problems. Since the bandwidth required by a CW signal is related to keying speed, a very tight filter system will impose limits on the upper end of your received speed range. Very narrow filters also can make receiver tuning very critical and can be tedious if either the receiver or transmitter has a small amount of drift.

Photo A. The author's HF station, the mighty Argonaut 515 QRP transceiver and the Radio Shack Color Computer. The CW interface is perched on top of the Argonaut. For the benefit of those who think that QRP is just for playing games, I resolved to work all states during the new year, even though I have time to get on only a few hours a week. That little Argonaut is my only HF rig, but you could never tell by looking at the log!

A bandwidth of approximately 150 Hz is a reasonable compromise, permitting keying in excess of 50 wpm, a very significant selectivity increase (yet not being overly fussy in terms of tuning and stability). The Q of a single filter stage of the type illustrated in Fig. 2 is not outstanding, but several stages can be cascaded to develop the desired aggregate filter response.

Gain in an active filter stage can be almost anything desired, but caution must be exercised so that excessive gain does not cause an overload of any detectors in the system. A target gain of 1 was chosen since plenty of signal is normally available from the receiver audio system.

The value for C is somewhat arbitrary, and for audio work either 0.1 or 0.01 uF is usually chosen for convenience. Since the center frequency is fairly low, let's use 0.1 uF for starters. If the filter parameters are plugged into the design equations of Fig. 2, we get the following:

Center Frequency	750 Hz
Bandwidth	150 Hz
Gain	1
R1 (input)	10,610 Ohms
R2 (shunt)	216 Ohms
R3 (feedback)	21,220 Ohms

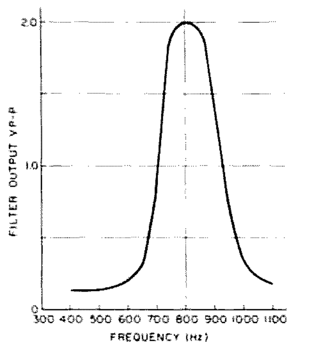
These are not exactly standard values, and rather than use multiple resistors in series/parallel to achieve precisely these values, you can rearrange the equations of Fig. 2 to see the effect on performance of substituting the nearest standard 5% resistor values:

R1	10,000 Ohms
R2	220 Ohms
R3	20,000 Ohms
Center Frequency	767 Hz
Bandwidth	159 Hz
Gain	1

Since our original parameters were seat-of-the-pants figures to begin with, the actual performance to be expected when standard values are used is quite acceptable.

The filter section of the actual interface (Fig. 1) consists of three identical stages (U1A–U1C) using these resistor values. The only departure from the general circuit in Fig. 2 concerns the biasing of each stage. For convenience, we want to use a single-ended power supply, so I biased the + input of each stage to +6 V with a voltage divider to ensure distortion-free ac amplification. This is another reason for limiting the gain of the filter stages, since we have only ±6 V of headroom for output voltage swing.

The actual frequency response of the three-stage filter is plotted in Fig. 3. The final stage of the quad op-amp package (U1D) is wired as a non-inverting ac amplifier that simply provides a variable gain block via the front-panel gain control. This provides considerable flexibility in the receiver audio gain setting, and rarely requires readjustment if your receiver has reasonable agc characteristics.



Frequency (Hz)	Output (VP-P)
400	0.15
450	0.15
500	0.15
550	0.20
600	0.20
625	0.25
650	0.30
675	0.55
700	0.80
725	1.30
750	1.80
775	1.95
800	2.00
825	2.00
850	1.95
875	1.85
900	1.45
925	1.05
950	0.75
975	0.55
1000	0.35
1025	0.25
1050	0.25
1075	0.20
1100	0.20

Fig. 3. Measured frequency response of the three-stage active filter used in the interface. The filter characteristics were determined using a commercial function generator as the signal source with an oscilloscope to measure the filter output voltage. The center frequency with the resistors used should have been approximately 770 Hz and the design bandwidth was 150 Hz. The measured center frequency was 812 Hz and the actual filter bandwidth at the -3-dB points was 220 Hz. This performance is entirely acceptable when standard resistor and capacitor values are used. The graph plots the data.

Tuning Indicator

Since we are using a sharp audio filter, a tuning indicator will ensure that your equipment is tuned precisely to the center of the filter bandpass and that it is properly tuned for zero beat. The popular NE567 tone decoder (U3) handles this job. This IC is driven at pin 3 by a sample of the filter output and is set to 750 Hz by the tune control. When a 750-Hz tone is present, indicating that the received signal has been properly tuned, pin 8 of U3 will pull low, lighting the tune LED on the front panel.

Keying Detector

The output of the filter also drives the keying detector, which consists of Q1, Q2, U4, and Q3. With sufficient drive from the filter network (dependent on the setting of the detector gain pot), Q1 will be turned on by audio signal peaks, thus causing its collector to pull low. The low at Q1's collector triggers a missing pulse detector composed of Q2 and U4. Timeout for U4 is adjusted so that the output of U4 (pin 3) will remain high when Q2 is triggered and will not transition low until several cycles of 750-Hz audio have passed. The output of U4 will thus follow the input keying, but it will not respond to the beat-note ac waveform.

Essentially, the missing pulse network can be considered a digital detector that eliminates the need for software filtering of the signal waveform. The high from U4 drives Q3, which causes the signal LED to be on whenever a detected waveform is present. If your software routine requires a TTL high to indicate keying, the connection should be made to point H. Alternatively, software that requires a low for beat-note recognition will require a connection to point L.

Keying Control

As noted earlier, most CW software keys the cassette control relay in transmit. A two-transistor keying-control circuit consisting of Q4 and Q5 is used to provide a universal interface between the cassette relay and the transmitter keying circuit. The relay contacts are normally connected between point K and ground. Q4 is normally biased on, causing the collector of Q5 to remain high. If the cassette relay closes, however, Q4 goes off and causes the collector of Q5 to pull low.

The transmitter keying circuit can be connected to point T if a solid-state keying circuit is used in the transmitter. If you are directly keying a tube-type transmitter, you may wish to use a reed relay and diode in the collector of Q5, and connect the transmitter-key contacts to the reed-relay contacts.

If your software routine produces TTL logic shifts at a port during transmit, you can interface to the keying circuit very easily. If a TTL low is produced during key-down intervals, connect the port to the base of Q4 and eliminate the 1k resistor at this point. If the routine uses a TTL high for key-down, then omit Q4 and associated resistors and drive Q5 with the output of the port dedicated to keying.

Power Supply

For the prototype, the required 12 V was obtained from the transceiver power supply. If this is not convenient, a separate 12-V supply can be included. The +5-V circuits are powered from the 12-V bus by means of an IC regulator (U2). Note that liberal bypassing has been incorporated throughout, including a 1-uF tantalum at the Vcc bus to each IC. This bypassing was found to be essential for stable operation.

Construction

The basic circuit can be wired with perfboard or one of the many prototyping boards that are available. Lead lengths around the filter stages and amplifier in U1 should be kept as short as possible. Layout around the other devices is noncritical.

As shown in Photo A, the prototype was housed in one of those readily available plastic instrument enclosures. I find that these are a pain to use: You must run ground leads everywhere since the case and panels are plastic, and the case itself doesn't provide any shielding. The cases do look good, however, and no trouble was encountered with this circuit application. Minimal front-panel controls include the gain control and the tune and signal LED indicators. No on/off switch or power indicator was included since the prototype was powered from the transceiver and is on whenever the transceiver is powered up.

The complexity of the rear apron will depend on the interfacing requirements for your hardware/software package. The interfacing for the Color Computer using the Chuck program involves a 5-pin DIN connector socket for the cable from the computer cassette port and a 4-pin DIN plug for the RS-232 port. Standard off-the-shelf cables from Radio Shack are used to interconnect the computer and interface unit. Your own system interface will govern the type of connectors needed for computer hookup.

In addition to the computer connectors, you will need a phono jack for the receiver audio line, another for the + 12 V, and a third for the connection to the keyed line of the transmitter. Standard shielded audio cables with phone plugs can be used for the interconnections between the interface and the rig. If you are going to tap into the receiver audio at the headphones jack, you will need a 1/4" phone plug at the transceiver/receiver end of the cable.

The headphones jack on most rigs is wired to silence the speaker when a phone plug is inserted. You can rewire the plug to defeat

this function, install a small speaker in the interface, or install an additional audio jack in parallel with the audio input and connect an external speaker to this jack. Since I rarely use phones, I opted to rewire the rig, but one of the latter two options is better if you use phones and want to retain the speaker blanking when earphones are employed.

Checkout

Tuning of the interface will require some means of measuring ac voltage. A scope is ideal, but an ac voltmeter that will let you measure signals of a few volts accurately will do. An analog meter (heaven forbid!) is preferable to a digital meter in this application.

Connect the scope or meter to the output of U1D through a small coupling capacitor (0.1 uF will do). Set the receiver audio gain for normal speaker level and tune across the signal from a crystal calibrator or some other stable source. A clean birdie will do the job if it is reasonably strong. Choose a dead band for this procedure, as we don't want tuning to be confounded by other signals.

Set the interface gain control to mid-range and carefully tune the receiver for maximum signal indication on the scope or meter. Now, adjust the tune control of the NE567 tone decoder until the tune LED lights. Reduce the interface gain and readjust the tune control as indicated above. Our goal is to adjust the tune control so that the tune LED will operate with the lowest possible signal level.

Return the gain control to mid-range and adjust the detector gain pot until the signal LED comes on. If this control is properly adjusted, the signal indicator will start to light just prior to the tune indicator as you carefully tune across the signal source. If the signal response is much broader than the tune response, reduce the detector gain. If it is narrower, increase the detector gain slightly. Making the signal response slightly broader than the tune response will let you hold the signal for a bit if the other station (or your receiver) is drifting slightly. The tune indicator, failing to respond to the signal, will alert you to the need for slight retuning.

Grounding point K (or applying the appropriate logic signal in the case of software that keys from an I/O port) should key the transmitter.

Operation

If you load and run your software at this point, you should be in business. Simply tune across the signal of interest until the tune indicator is solidly flashing in response to the keying. Both the tune and signal indicators should be merrily flashing away at this point, and received CW should be appearing on your video monitor. If you switch to the transmit routine, you should be keying the transmitter from the keyboard.

QRM will usually be rejected by the interface if it is more than 100–150 Hz away from the desired signal. Very strong QRM might, however, capture your receiver agc and cause the desired signal to drop down to the point where the tune and/or signal indicators become erratic. This is usually a problem only when the desired signal is quite weak relative to the QRM. Unless the offending signal is very close to the frequency, you can usually increase the gain to the point where the desired signal is readable without interference.

Noise effects come in two varieties. On the higher frequencies, the noise is usually quite consistent in level and will cause little difficulty as long as the signal-to-noise ratio is reasonable. Static crashes are another matter, as they can have a high but short-term amplitude. I generally try to adjust the receiver rf gain and the interface gain so that the signal indicator ignores all but the worst bursts, providing pretty clean copy if the desired signal level is reasonable. You will have to face the fact that no interface or software routine will give solid copy with a QRP or weak DX signal on 40 and 80 when there is heavy QRN.

The interface will provide solid copy in excess of 50 wpm, which is right in line with the bandwidth of the signal filters. Accurate assessment of the speed performance of your software is best determined using the W1AW code practice runs: W1AW usually puts in a strong signal and the code is machine-generated.

It will not take you long to realize that, with the exception of some really good CW operators, the best copy comes from operators using keyboards. When sending at high speed, most ops using a keyer or hand key will begin to get erratic with their spacing and character formation. It is disconcerting to tune across a high-speed CW signal and read:

T5E X YL HAW T5I NE W RSG

when a keyboard would have delivered the more legible:

THE XYL SAW THE NEW RIG

All in all, I think you will find the interface circuit highly satisfactory for most operating situations. It also will provide the basis for some simple circuit experimentation if you want to design that elusive perfect interface.

Machine-generated CW has the benefit of sounding good regardless of your manual keying skills, but you must type reasonably accurately. Machine-read CW is fun and provides visitors to the shack with a means to follow your contacts. I think my wife now believes that CW operators are real people! Just remember not to get in over your head in terms of operating speed. You will always run into situations where the machine copy will drop out and you will have to carry the mail with your own built-in CW processor! I get a kick out of being able to hang in there when the machine has to quit. If you lose, or worse yet, fail to acquire that skill, your computer may be a CW operator, but you are not!

So warm up the soldering iron and get the computer on the air. If you operate QRP as I do, you will have the distinction of operating a station where the keyer consumes more power than the rig! It may not seem sensible, but it is a lot of fun! ■

Guy Slaughter K9AZG
753 W. Elizabeth Drive
Crown Point IN 46307

You, Too, Can Be An SOB

K9AZG thinks that hams should be heard but not seen—put your left hand on the Callbook *and repeat after me . . .*

Number 6 on your Feedback card

As president and organizer of a new fraternity aimed at recapturing the traditional policies of hamming, I invite those few remaining radio amateurs who shun personal contact with other hams to join an international net known as the "Solitary Operators' Brotherhood."

We are not to be confused, however, with chronic QRMers sometimes referred to by our initials. When you hear an irate operator saying, "Sorry, Charlie, I missed your QTH on account of them SOBs was tunin' up on you again," the chances are he is not referring to one of us.

We legitimate SOBs, whether or not we use dummy loads, have banded together to preserve and perhaps rebuild what has become a dying subculture among amateurs. We offer an alternative to hamfests and club meetings and picnics and eyeball get-togethers of all kinds, because we share one fierce conviction: We believe in communicating with our fellow hams, but not in mingling with the buggers.

Hamming is for chatting from a distance, we think. It is for exchanging thoughts, ideas, information—even for sharing emotions—with strangers out there in Radio Land whom we cannot see and by whom we cannot be seen.

Because they are invisible to us, we perceive those we contact as perfect creatures, handsome, wholesome, witty, wise, paragons of beauty, knowledge, and virtue. And because we are invisible to them, we can assume their perceptions of us are equally inaccurate.

This pleasant state of affairs exists, of course, only for as long as we avoid physical contact with each other. It instantly evaporates if and when we visit each others' shacks or eyeball each other at club meetings, hamfests, banquets, flea markets, or any of the myriad of similar illusion-destroying social events at which non-SOBs congregate. For who can deny that to meet a fellow ham—any fellow ham, every fellow ham, however delightful his/her voice, whatever the perfection of his/her on-the-air manners—is to be disillusioned, to discover that he/she is, like the rest of us, a scruffy mortal with a runny nose, rumpled clothes, and scratches on his/her gear.

Despite this obvious truth, the tendency among most radio amateurs today is to socialize, to congregate, to mingle. And that is fine for those who so enjoy the emotional reinforcement of flocking together with birds of like feather—they don't mind the disillusionment it inevitably brings.

But the Solitary Operators' Brotherhood was organized for those of us who think it more appropriate to emulate the pioneers of our hobby. Those giants of spark and coherer or cat-whisker days sat alone in attic and basement, history tells us, tinkering up QSOs with other weirdos in other garrets and other cellars, blocks and even miles away. That was the golden age, as we SOBs see it, the era of hermit hams, of non-gregarious gadgeteers, of antisocial pseudo-scientists who loved their Leyden jars and revered their variocouplers, but hated interruptions and despised company.

> ***"We believe in communicating with our fellow hams, but not in mingling with the buggers."***

Today, we of the Solitary Operators' Brotherhood have readopted that ethic. We contend that, while other hams have interests akin to ours, all hams are strange by definition, some even stranger than we. We feel very strongly, therefore, that hams should never congregate in groups larger than one, lest the enormity of our cumulative strangeness become apparent to others or, worse, obvious to ourselves.

The SOB constitution, therefore, requires members to avoid face-to-face meetings with other amateurs. This is our only caveat, though SSTV and FSTV operators are obviously ineligible. There are no initiation fees, no dues, and above all, no meetings to attend. In fact, if any SOB goes to any kind of amateur social affair anywhere, he is subject to instant expulsion. And so compliant with this rule are we that none of us ever has been expelled. "Once an SOB, always an SOB" is our motto.

So how do you join?

Membership is by over-the-air invitation only. Any amateur holding any class of license anywhere in the world is welcomed (SSTV and FSTV ops aside) so long as he swears on the memories of Hertz, Steinmetz, Phelps, and The Old Man himself to abide by the no-meetings rule.

(Phelps, Herman W., ex-1XGZ, for the benefit of those who may not be thoroughly schooled in early amateur lore, was the first licensed ham operator to fracture his skull on an attic rafter while jerking his lip away from an rf arc drawn off a carbon microphone loop-modulating a self-excited 210 on or near 160 meters.)

To join, find a member to sponsor you, vow to avoid personal meetings with other hams (unless you have some in your immediate family; the rules allow limited contact with licensed kin). If he agrees to be your SOB-father, you are in.

So how do you find us?

Just start asking each of your contacts hereafter—on phone, CW, or RTTY and on whatever band—if he is an SOB. Nonmembers usually will deny it. Now and then you may even run across a guy who'll mutter nasty comments about you and break off the QSO. But sooner or later you will run across a real member of the Solitary Operators' Brotherhood eager to make you one as well.

"Welcome aboard, you SOB," he'll tell you. "Now you are one of us."

And then you will know you have become a real SOB, pledged to carry on the almost-forgotten tradition of the old-timers who labored alone to contrive their magical visits with others out there, unseen, unmet, unrecognized for what they were and what we are today—scruffy humans with runny noses, rumpled clothes, and scratches on our gear. ■

Paul M. Danzer N1II
2 Dawn Road
Norwalk CT 06851

Tap, Tap, Tap, Clunk

Splice an ASR-33 to your VIC-20 for RTTY hard copy— you won't believe how much paper you'll need!

Number 7 on your Feedback card

There are very few true bargains in the ham world these days, but certainly the VIC-20 is one of them. You can get the computer inexpensively, and by adding a small commercial software package you can quickly be on the air with all speeds of RTTY and ASCII. An additional bargain is a used ASR-33 (or similar ASCII keyboard/printer combination), which has an expected life that probably exceeds your own.

As a long-time ham and bargain hunter, I couldn't resist either of these two units. The VIC-20, combined with a general-coverage receiver, allowed me to read the news-service transmissions from agencies all over the world. After a few weeks of this, it was time to attach my other toy, the ASR-33, and get hard copy.

The only problem was that the two would not work together. The VIC-20, equipped with commercial ham software, provides a parallel output at the user port, and the ASR-33 is a serial machine. While the VIC-20 has a serial output port, the software drives only the parallel port.

"Somewhere in the depths of Teletype Corporation there is a document that tells how the standard modules making up your machine were wired."

Block Diagram

The solution was to run down to Radio Shack and pick up a little beast called a universal asynchronous receiver/transmitter (UART), which is specifically designed to convert parallel ASCII to serial or serial to parallel. It is contained in a 40-pin package and runs from a single 5-volt power supply.

The block diagram in Fig. 1 shows the UART as IC2, with eight parallel data bits and a data strobe coming from the VIC-20. IC1 is a 555 set up as a clock oscillator with a frequency of 16 times the baud rate of the serial output. Since the ASR-33 is a 110-baud machine, the clock was set to 1760 Hz.

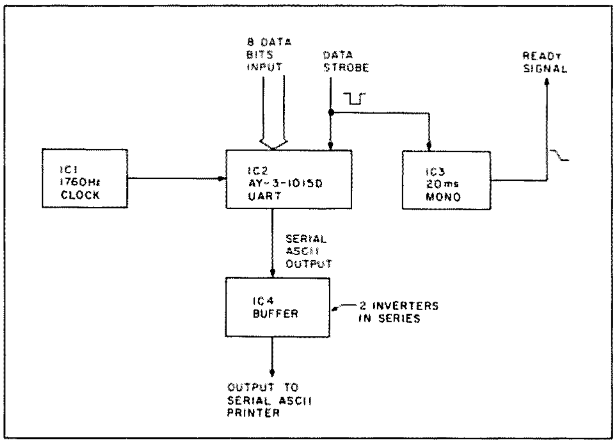


Fig. 1. Block diagram.

You could question if IC4 is needed at all. It is a 7400 chip wired to put two gates in series as a non-inverting buffer amplifier. While I don't doubt that the UART could drive a few feet of wire to the ASR-33 without buffering, I would rather blow up an 89¢ microcircuit such as the 7400 than the $6 UART if the lead shorted to some unlikely place.

The remaining microcircuit, IC3, is another 555 used as a one-shot attempt to fool the VIC-20 and tell it that the UART is ready for more data. Why I had to do this rather than use the real acknowledge pulse is explained toward the end of this article.

Circuit and Layout

Fig. 2 is a combination circuit diagram and layout. The four microcircuits are shown in a line mounted on a Radio Shack Experimenters PC Board. The horizontal lines labeled "bus X" and "bus Y" correspond to the bus layout on the board. The top bus is connected to +5 volts from the VIC and the bottom one to ground.

A two-foot length of ribbon cable is used to connect the computer to this board. The rib-

Parts List

IC1, IC3 —555	R4 —470k, ¼ Watt
IC2 —AY-3-1015D	C1 — 10 μF, 50 volt
IC4 —7400	C2 —.01 μF, 50 volt
R1 —50k pot	C3 —.01 μF, 50 volt
R2 —33k, ¼ Watt	C4 —.05 μF, 50 volt
R3 —20k, ¼ Watt	C5 —.01 μF, 50 volt

IC sockets, 40-pin, 14-pin, and two 8-pin, PC board (Radio Shack 276-170), connector (RS 276-1551), and ribbon cable (RS 278-772).

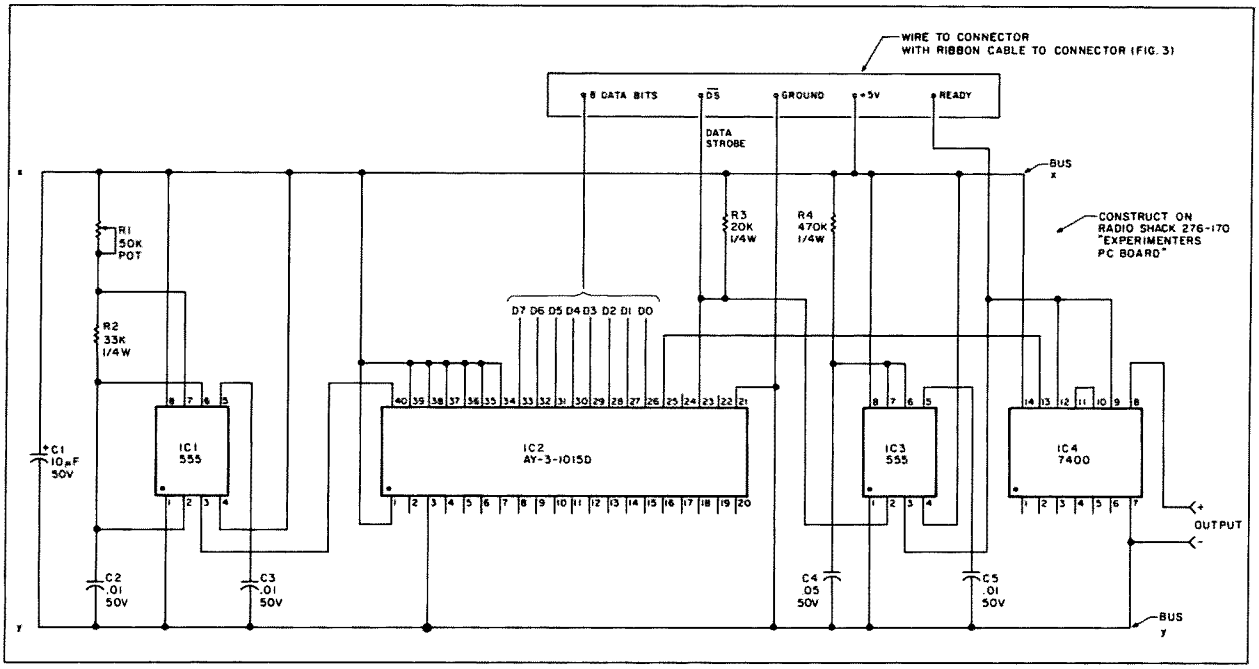


Fig. 2. Schematic and layout.

bon cable passes over the part of the board outlined at the top of the layout, and a small piece of plastic corresponding to the outline is screwed to the board to hold the ribbon cable in place.

R1 is used to set the clock frequency to 1760 Hz. I would suggest looking for a multi-turn pot, although the setting is not all that critical. R2 is a fixed resistor and offers no problems. C2, which is the third part of the frequency-setting circuit, should be a polystyrene cap (Radio Shack 272-110) rather than one of the usual disc-ceramic units.

Assuming no other problems, you can just build up the unit, connect it, and adjust R1 until the ASR-33 starts to print real words rather than garbage. However, the easiest way to set the frequency is by connecting a frequency counter bewteen pin 3 and ground and adjusting R1 for a reading of 1760.

Input and Output Connections

A rear view of the needed 24-pin connector is shown in Fig. 3. Yes, needed but not found. Not to worry, however; good old Radio Shack to the rescue. They offer a 44-pin connector (number 276-1551). With your trusty hacksaw, cut off a section containing 24 pins (two rows of 12) and you have it made. Just be careful to line up the uncut end of the connector with the VIC connector at the back of the VIC-20 so all pins will meet. I would also suggest connecting and disconnecting the circuit only when the power is off.

Connections to the ASR-33

I happen to own an old ASR-33, but all of the following comments apply to any of the 32, 33, and other series that have a printer function. Each of these machines is wired differently for each customer and, presumably, somewhere in the depths of Teletype Corporation there is a document that tells how the standard modules making up your machine were wired.

I took mine apart and, of course, couldn't figure it out. However, I did manage to find the power supply, which is wired in series with the printer. I broke one of the leads, inserted an electro-optical coupler (watch the polarity), and drove the input with a 5-volt signal through a 330-Ohm resistor. It worked for me and probably will work for you.

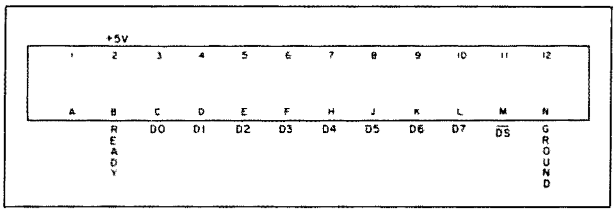


Fig. 3. Rear-view connector to VIC-20 user I/O port.

Incidentally, by increasing the resistor to account for the higher voltage in a standard serial RS-232 line, I hooked the printer to my Apple and now have a backup printer.

If You Have Problems

The only tricky part of the circuit is the READY or ACKNOWLEDGE pulse, which must be fed back to the VIC to tell it that the UART is ready to receive the next character. The UART has an output just for this purpose; it's called Transmitter Buffer Empty (TBMT). Unfortunately, this signal occurs one or two clock pulses after the VIC sends the data-ready pulse, or a maximum of around one millisecond.

The commercial software is set up to look for a one-to-zero (+5 to ground) transition as the ready signal, but the software is relatively slow and the TBMT occurs before the software is looking for it. Therefore, IC4 is set as a one-shot attempt to produce a one-to-zero transition 10 to 20 milliseconds after the data strobe, when the software is looking for it. The trick works for all Baudot speeds and for ASCII up to 110 baud.

It is possible that your software was written to look for a positive level as the ready signal, in which case the one-shot technique will still work. However, if it is perversely written to look for a zero or ground signal, there are two spare inverters left on IC4. Just connect the output of IC3 (pin 3) to pin 1 of IC4 and take the zero output on pin 3 of IC4.

If you are really a purist or one of those people who like to get rid of chips, IC1 and IC3 can be combined into a dual unit sold as the 556.

Other serial printers can use this circuit. The ASR-33 and similar machines are set for one start pulse, two stop pulses, no parity, and eight data bits. If you have a machine that requires some other combination, pins 35 through 39 of the UART allow alternatives. Pin 34, the control strobe, is hard-wired to +5 to allow these selections.

Now my VIC provides hard copy. In addition to ham QSOs, I can tune in AP from London or the XINHUA news agency from Beijing, China, and read the printed copy. You know, it just dawned on me that I can get the same thing for 25¢. It's called a newspaper. And it has comics, too. Hmmm, does anyone have information on commercial FAX converters?■

Si Dunn K5JRN
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KOKO—The Kids' Own Kode Oscillator

Watch those little eyes light up when your children "play ham radio!"

Number 8 on your Feedback card

One night recently, as I concluded a short contact on CW, I felt tuggings at the sleeve of my keying arm. At my side stood a delegation of two: Sammy, age 8, and Shelly, age 9.

"Daddy," they announced in ragged unison, "we want to learn Morse code."

Pleased, I sat them right down and taught them the letters "E," "T," "I," and "M"—in minutes, they could copy the word "time." Young minds do learn quickly.

But the sidetone of a Kenwood TS-520S is an expensive code practice oscillator. And the kids certainly could not (and better not!) lug my transceiver off to their rooms to practice. They needed their own code oscillator. So KOKO (the Kids' Own Kode Oscillator) was born.

This circuit was designed, built, and tested in less than two hours. At times, the kids watched the wiring, and I tried to explain what some of the parts do. But mostly, they just coughed dramatically, pinched their little noses, waved their hands, and complained: "Daddy, solder stinks!"

They'll learn. They'll learn.

A Simple Circuit

The Kids' Own Kode Oscillator is a very simple circuit. You can tailor it to fit the parts you have on hand. You also can use it with a small speaker instead of earphones.

If you enjoy being fancy, you can drill and etch a printed circuit board. Or you can use a piece of perfboard and point-to-point wiring. Mr. (Lazy) Wizard here chose one of Radio Shack's pre-etched and pre-drilled single IC boards (part number 276-024). KOKO's parts take up only a third of the available space on that board, so plenty of room is left over for refinements or outsized components from the junk box.

The 555 timer and eight-pin socket are mounted on the un-coppered side of the board. The rest of the circuit's components are soldered to the copper pads. The board and 9-volt transistor radio battery all fit nicely inside a small minibox or plastic enclosure.

When keyed, the oscillator draws about 8 or 9 milliamperes from its 9-volt battery. With proper care, KOKO's battery will outlast the batteries in most motorized toys.

Setting the Tone

Potentiometer R3 varies the pitch of the audio-frequency oscillation. For greater economy, R3 can be replaced by a standard-value fixed resistor, such as 68k or 47k. The only disadvantage is that to change the pitch to a higher or lower frequency, you have to unsolder the resistor at R3 and replace it with another value.

If a standard-value resistor doesn't quite give you the desired audio frequency, you can wire one or more lower-value resistors in series with it or string several resistors together until you get the pitch you prefer.

Another way to change the frequency of the oscillator's tone is to use higher or lower values of capacitance at C3. Or try shunting

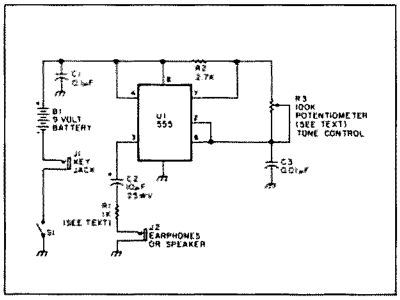

Fig. 1. You can show your kids KOKO's parts and how they're drawn on the schematic.

Parts List

Resistors	
R1	1k-Ohm, 1/4-Watt or 1/2-Watt (see text)
R2	2.7k-Ohm, 1/4-Watt or 1/2-Watt
R3	100k-Ohm potentiometer (see text)
Capacitors	
C1	.1-uF disc ceramic or similar
C2	10-uF, 25-WV electrolytic
C3	.01-uF disc ceramic or similar (see text)
Miscellaneous	
U1	555 timer (Radio Shack 276-1723)
J1, J2	Two-conductor phone jacks
S1	Single-pole, single-throw switch (slide or toggle)
	Telegraph key
	Low-impedance (8- or 16-Ohm) earphones or speaker
	Phone plugs to match J1 and J2
	9-volt transistor radio battery
	Battery connector
	Metal or plastic enclosure
	Printed circuit board (Radio Shack 276-024) or small piece of perfboard
	8-pin IC socket (optional)

various disc-ceramic capacitors across the capacitor at C3 until you like what you hear.

Volume Control

Resistor R1 sets the volume in the earphones or speaker. A value of 1k gives a comfortable listening level in a cheap pair of 8-Ohm earphones or one of those tiny monophonic earpieces.

For room-level volume—to teach the code at a radio club meeting, for instance—change R1 to a much lower value, such as 100 Ohms or 22 Ohms and use a small 8-Ohm or 16-Ohm speaker in place of the earphones. But keep a spare battery handy; the 555 timer draws nearly 50 milliamperes in this configuration.

To Switch or Not to Switch

Switch S1 definitely is a frill that can be eliminated from KOKO. However, I added a single-pole, single-throw slide switch and attached labels that say ON and OFF because I wanted the junior operators to learn proper respect for power switches.

Now, when I'm working DX, and I feel a tug at my sleeve, it's usually a happy kid announcing, "Daddy, I just sent 'CQ Cabbage Patch Kids'!" or "Daddy, I just worked Mister T on six meters!"

If you're wondering where all the new hams are going to come from, look around your house or neighborhood. Would a youngster you know (or a stodgy adult) enjoy having his or her own code-practice oscillator? ■

I. M. Gottlieb W6HDM
931 Olive Street
Menlo Park CA 94025

Cosmic QRN

Are there messages in the noise?

In the event that neither ancient sage nor modern guru has enlightened us that one thing leads to another, let such words of wisdom hereby come into being.

The "one thing" commenced one evening while I was relentlessly rocking the channel-selector knob on my TV set. I was, of course, conducting the ever-going search for program material not too insulting to my intellect nor too shocking to my emotions. After having scanned the usual collection of pantyhose ads, get-rich-quick schemes, maximized discord known as rock "music," and scenarios of violence untempered by man's experiments with civilization, I finally wound up on a UHF-channel midway between two rather anemic stations.

There I sat, utterly transfixed with the dancing specks of snow on the TV screen. How long I endured in this posture I do not know. I must confess, however, that the ever-changing, yet ever-the-same display proved of greater interest than any of the program material I had briefly appraised. Indeed, while I cannot prove that I had fallen into a hypnotic stupor, I recall only that the experience was pleasant, serene, and downright compelling.

Upon slowly recovering from this daze, I found myself aware of some rather strange aspects of the flurry of particles gyrating before my eyes. Superimposed on the random display, I thought I observed symmetrical patterns and geometric shapes—some were formed of straight lines, but others resembled the curved outlines of flowers. And, intermixed with the black and white specs were transient flashes of red, blue, and green.

Now, maybe this wouldn't have astounded you, OM, but seeing such colored snow on a vintage vacuum-tube black-and-white TV set abruptly alerted my drowsy brain and started me on a wild thinking spree. My initial deduction was that it must be possible to receive color programs on an ordinary black-and-white set. All I would have to do is identify the mechanism responsible for the "leak-through" of color modulation and then optimize its effect.

Alas, as you may have deduced, it was not to be! But even if I did not emerge as a newly made millionaire from a great technological breakthrough, all was not lost; the experience engendered other interesting ideas, which I would like to share with you.

Noise = Nuisance? No

Noise may be a nuisance, but it stimulates conjecture.

I am by no means the first alleging to have seen something other than pure randomness in the noise coming out of the video channel. The eye is notorious for its ability to generate illusions. Phosgenes—the stars and other geometrics you "see" as the result of mechanical pressure on the eyelid—can be stimulated in various ways. And, when the brain gets into the act, you can all too easily perceive depth, movement, color, or objects that do not exist.

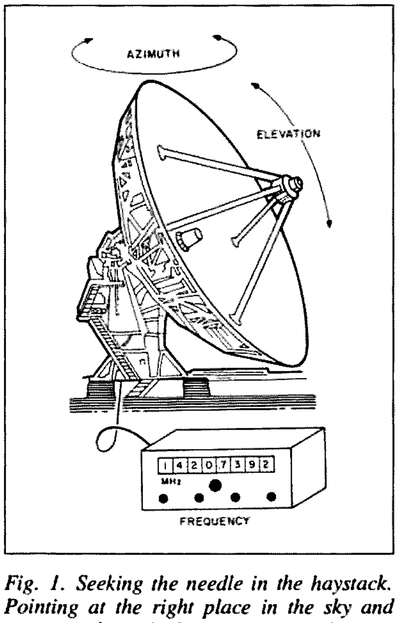

Fig. 1. Seeking the needle in the haystack. Pointing at the right place in the sky and tuning to the right frequency pose a horrendous burden on the probability of detecting an extraterrestrial.

Notwithstanding all this, it is both intriguing and interesting to speculate on the possibility of intelligence or information being *contained* in a noise spectrum. If one didn't know otherwise, the rat's nest of wavy lines that comprise the oscilloscopic display of TV video modulation could be interpreted as electrical noise from a worn motor brush or from a defective fluorescent lamp. Hams have long been familiar with techniques for extracting weak signals from a background of noise, QRN, and interference. And we know that these techniques have been carried to sophisticated levels in radar, in sonar, in the reception of data from space vehicles, and in radio astronomy.

During recent years, a whole new communications technology has evolved around a more elegant concept than the mere extraction of signals from noisy backgrounds. Known as spread-spectrum modulation, the new technique comes quite close to using noise itself as the carrier of information. We find ourselves reminded of the adage, "If life gives you lemons, make lemonade." In a somewhat analogous manner, this discussion will speculate that nature (and maybe extraterrestrial intelligence) has *already* put noise spectra to good use!

Noise = Nuisance? Yes

Noise was put here to degrade communications—or so it seems.

Some illumination can be cast on our speculation that intelligence may reside in noise by considering briefly the close link between noise and entropy (which tells us that ultimately all matter in the universe will attain the same average temperature). Both signify vanishing coherence and engulfing randomness. Under such an eventuality, there will no

longer be any evidence of logical arrangement, ordered sequence, or privileged position. Here, it is interesting to contemplate that the speed of light in empty space is forbidden to matter and limits both energy *and* communications.

Electrical noise in its idealized form is known as "white noise" and is composed of a purely random selection and sequence of frequencies and amplitudes. Although the rigorous definition of white noise requires an infinite bandwidth, practical white noise is said to exist when a finite spectrum of the disturbance exhibits equal energy per unit bandwidth. Thus, in an audio system, equal loudness would be perceived for, say, any 100-Hz band; such bands could be from 100 Hz to 200 Hz, 600 Hz to 700 Hz, or 2,300 Hz to 2,400 Hz, etc. On the other hand, so-called "pink noise" is characterized by equal energy per octave. This means that the same energy would be contained in the 100–200-Hz band as, say, in the 500–1,000-Hz band.

There are many other types of noise spectra, but in communications work they all tend to have similar effects with regard to the transmission of intelligence. That is, they all *sound* like noise and are known for their abilities to drown out or otherwise degrade or destroy intelligibility. As far as our ears or eyes are concerned, noise replaces coherence and logical sequence with randomness.

Considering the prevalence of noise sources—terrestrial (man-made), galactic, thermal, and interfering stations—it almost seems that nature is against us in our pitiful efforts to squeeze narrowband modulation formats through a vast sea of noise energy. Inasmuch as noise will not go away, could we possibly find another way of dealing with the problem?

Yes and No Noises

There are noises and then there are noises.

Some of the noise in nature may one day be found to be something more than stray energy in quest of the most random format of distribution it can find. Physicists with the boldness and imagination needed to deviate from the views of establishment science have suggested that there may be a counterforce in nature in which systems tend to evolve *from* randomness *to* patterns of more logical distribution, and from simplicity to complexity. Note that this goes contrary to entropy in which complexities break down and coherence degrades into a homogenized crazy quilt.

Interestingly, in the domain of organic evolution, we apparently do see evidence of "reversed entropy." Are we not told that complex life forms descended from simpler forms? And surely there is greater logic in the brains and nervous systems of higher animals than of lower ones. Thus, in the countless billions of trials, experiments, extinctions, and mutations conducted by nature over billions of years, there has been some kind of reasoned goal—a thread of coherence within an apparently blind randomness of purpose. In communication terms, we could say that there has been a signal buried in the noise!

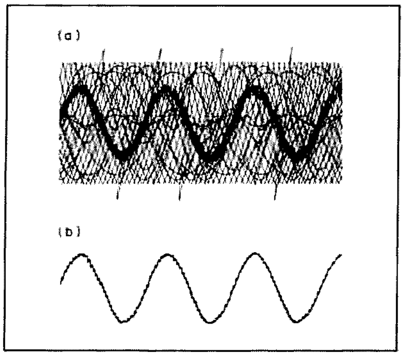

Fig. 2. Recovery of a signal from a background of noise. (a) The commonly encountered signal-plus-noise format. (b) The extracted signal after processing by filtering, integration, or correlation techniques.

The universe is alive with radiant energy involving frequencies in the radio, microwave, optical, X-ray, and gamma-ray spectral regions. All told, these radiations assume the characteristics of a lot of meaningless wideband noise. Upon closer scrutiny, it has been discovered that "every little photon has a meaning of its own"; more has been learned from spectroscopic interpretation of such radiation than was ever even suspected previously.

Not only can we infer the composition, temperature, dynamics, and history of distant worlds, but various hypotheses (even those bordering on fantasy) can be propounded that otherwise would be totally lacking in support. But let us not forget that much of yesterday's science fiction is today's technological hardware.

If you keep up with the literature on the subject, it certainly must appear that we are closer than ever before in our quest for the reception of radio signals from other worlds. Receivers are more sensitive than before and they generate much less noise. Antennas are larger, producing more gain, and they discriminate better against noise from terrestrial sources. And front-end selectivity has been enhanced to the extent that minimal galactic noise is admitted.

The greatest advance has been in the strategy of the search program itself. Previously, a tiny sector of the sky was scanned in frequency, and then the process was repeated for other small patches of the celestial sphere. This was, of course, both laborious and inefficient considering the size of the universe together with the extensive frequency range that could conceivably bear meaningful modulation.

Sometimes simplifications were made in attempts both to decrease the searching task and to enhance the probability of success. One such technique involved the notion that extraterrestrials would be smart enough to transmit in the band bounded by the natural radiation of hydrogen (1420 MHz) and the hydroxyl ion, OH (1662 MHz). We suspect the predominent element in such searches was none other than the fickle nature of lady luck. She has yet to smile on our endeavors!

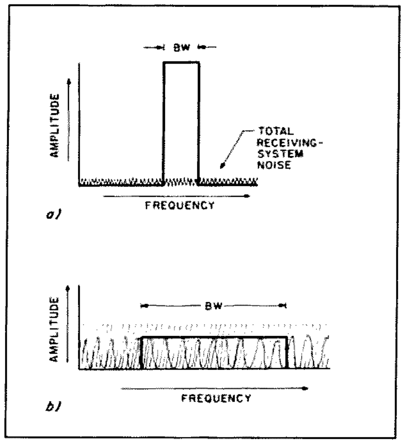

Fig. 3. Comparison between conventional and spread-spectrum signals. The power density of the spread-spectrum signal is very small compared to conventional modulation formats; indeed, the spread-spectrum signal may even be below the noise floor of the receiving system. (a) An ordinary signal in the rf spectrum. Here, the bandwidth may be about 3 kHz. (b) A spread-spectrum signal. Bandwidth could be a hundred thousand times wider than the bandwidth of the ordinary signal.

Sophisticated computer programming can now automate the process. The computer can evaluate a signal that is peculiar by virtue of its coherent, logical, or non-random format. Of course, the hoped-for signal will have originated from a civilization not too many light-years distant so that an eventual two-way QSO will not entail much more than a human generation.

But, tuning in a narrowband signal and excluding noise may have some holes in it. Inasmuch as noise is so much a part of the universe, why not suppose that those brainy extraterrestrials have devised methods of harmonizing with this fact of nature rather than fighting it?

Broaden the Noise?

Spread-spectrum modulation—putting "broadband splatter" to work.

By hint and allusion, suggestions have been made that apparently random broadband noise can contain coherent information. Nowhere is this better demonstrated than in the now evolving technique of spread-spectrum communications.

Spread spectrum, as the term implies, is a broadbanded modulation format. However, it must not be thought of as merely involving a wider frequency range than more conventional modulation spectra. If that were the case, all one would have to do would be to increase the deviation of an FM signal. But such a stratagem would fail to yield the unique features of the spread-spectrum technique.

Not only is a spread-spectrum signal *very* much broader than you could readily produce with a high-deviation FM signal, but the frequencies in spread-spectrum transmission are

The Excitement of Satellite Communications

An ever increasing number of radio amateurs are joining the excitement of Phase III-type satellite communications, and there are some good reasons. This new medium combines the communications range of the 20 and 80 meter bands with the line of sight reliability of 2 meters in a completely perfected manner. It's equivalent to a totally new band, it's unaffected by sunspot variations, and a vast technical background isn't necessary for enjoying the action.

ICOM America stands ready to help you enjoy the fascinating new capabilities of OSCAR 10 and future amateur satellites, and it has a full line of equipment to back that statement. Its all mode 2 meter and 70 cm base transceivers bring the operating conveniences of low band units to the VHF and UHF amateur bands. They can be used for local FM operations via repeaters or for SSB/CW communications via any Phase III OSCAR satellite. The new iC-1271 all mode 23 cm transceiver is in a class of its own, providing mode L satellite uplink capability (mode L is 23 cm uplink, 70 cm downlink) and optional fast scan amateur TV operations using home video equipment.

The overwhelming preference of mode B equipment (435MHz band transmit, 145MHz band receive), among OSCAR groups and users, is ICOM's IC-271H and IC-471H transceivers. Why? Satellite relayed signals are somewhat weak in nature, and the IC-271H's low noise/high sensitivity receiver gives the highest possible performance for hearing everyone regardless of their uplink performance. The IC-271H's noise blanker also prevents pulse-type electrical interference from masking some highly desired DX signals, and its selectable AGC can follow fast fades associated with spin modulation. There are also 32 all mode memories which can be used for intermixed FM repeater and SSB/CW operations. When the IC-271H is equipped with the optional mast-mounted AG-25 GaAsFET preamp, it becomes a satellite operator's dream come true.

ICOM's IC-471A (25 watts output) or IC-471H (75 watt output) 70 cm transceivers boast an output signal that's recognized on the satellite by its crystal clear audio. Power output of either unit IC-471A/IC-471H is continuously front panel adjustable to adjust to daily signal variations. This sidesteps the taboo practice of overloading a satellite's on-board receiver. The IC-471A/IC-471H also includes 32 all-mode memories for the ultimate in operating flexibility.

ICOM's IC-PS30 system DC power supply is an ideal single cabinet unit for simultaneously powering both satellite transceivers, or the IC-271A and IC-471A can be equipped with an optional PS-25 internal DC power supply for "stand alone" operation. A pair of small 16 element antennas, one for 435MHz operation and one for 145MHz operation, connect to their respective transceivers to complete the space-age setup. No complex interwirings are necessary in the previously described setup.

Operating OSCAR 10's popular mode B is almost as easy as operating an HF band. The satellite's band centers are 435.100MHz uplink (receive from ground operators) and 145.900MHz downlink (transmit back to ground operators), with its band edges roughly 50KHz above and below those frequencies. Assuming both transceivers are tuned to band centers, ones own satellite-relayed signals can be received while transmitting and used for "tweaking" antenna positions and offset-tuning doppler shift. OSCAR 10's inverting passband is then tracked as follows: for each KHz the IC-271H's receiver is tuned above 145.900MHz, the IC-471A/471H's transmitter should be tuned an equal number of KHz below 435.100MHz to "zero beat" others. The accurate readout of ICOM's digital displays even eliminate the need to "talk oneself onto frequency."

If you're interested in joining today's most exciting era of amateur communications, OSCAR 10 and future Phase III satellites are the medium to use. If you appreciate top performance equipment for those activities, ICOM is the logical choice. It's simply the best, and it's backed by an uncompromised policy of top service. Isn't it time you enjoyed these exciting pleasures?

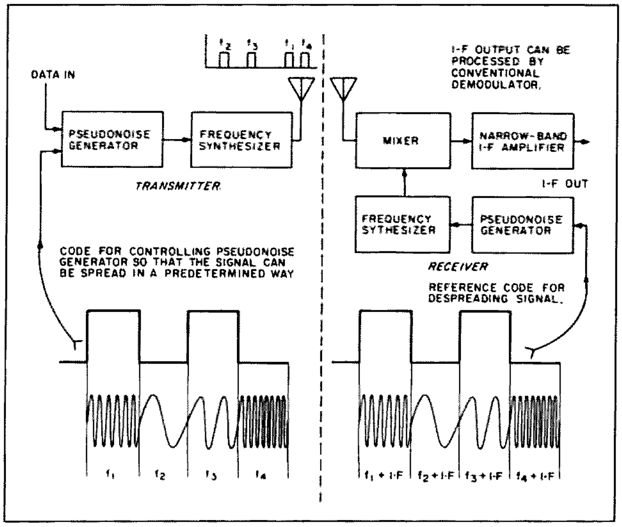

Fig. 4. Simplified block diagram of the spread-spectrum communications link. This "frequency-hopping" system transmits and receives over a bandwidth that is many times that of the data. The actual spectral distribution of the signal is controlled by a predetermined code that must be the same for both transmitter and receiver.

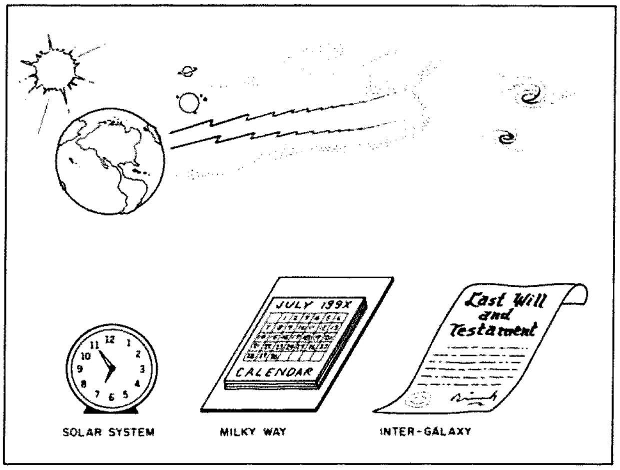

Fig. 5. Propagation time is presently an insurmountable problem. Ranging from minutes, hours, and days to years, generations, and millenia, the solution to this problem would require a true scientific breakthrough.

unrelated to the modulating information. Rather, the spread-spectrum frequencies are generated in near-random fashion throughout a wide, but prearranged frequency range. This is accomplished by the so-called pseudonoise generator.

The pseudo-noise generator causes a time and frequency distribution of the rf in such a way that a conventional receiver would deliver a hissing sound, which could easily be interpreted as just some more noise background. Indeed, the hiss might even be *submerged* in the overall noise of the receiving system. This is because the power density of the spread-spectrum signal is extremely low, the total power being spread over such a wide band.

In actuality, the time and frequency distribution of the spread-spectrum signal is not a random occurrence. Rather, it represents a predetermined *code*. This requires that the receiver know this code in order for the inverse operation, de-spreading, to be performed. Once de-spread, the signal can be demodulated by conventional means so that the original information can be recovered.

It follows that not only must the receiver have the same code that produced the spread-spectrum format in the transmitter, but means must be provided so that the despreading operation in the receiver is *synchronized* to the spreading operation in the transmitter. Otherwise, there will be no response to the signal. A corollary of this is that this communications technique is inherently immune, or very nearly so, to interference from conventional signals, other spread-spectrum signals, intentional jamming, and other disturbances.

There is more than one way to produce spread-spectrum modulation. A straightforward approach is frequency hopping. As the term suggests, the frequency is hopped all over the spectrum. The hopping is done according to a code and must be dehopped in the receiver by means of the same code. Although spread-spectrum modulation may appear to be fearsomely complex, the use of VHSIC dedicated modules, processors, charge-coupled devices, surface-wave acoustic devices, and other high-technology components renders this communications technique both practical and reliable.

Narrow the Noise?

Narrow band, high selectivity, and low-noise amplification, but no cosmic signals!

If an extraterrestrial were trying to alert or communicate with us, would a spread-spectrum signal of some kind make sense? A knee-jerk answer would be no, for the reason that we do not have the de-spreading code necessary for the recovery of modulation. However, this need not be construed as an insurmountable obstacle by the extraterrestrial. For one thing, if it were suspected or even hoped that we have technological moxie, it would not be unreasonable for him to endow us with the capability of empirically or logically deriving the needed code. On his part, the extraterrestrial would have used a relatively simple code, perhaps one linked to some mathematical progression or some universal constant that scientists worth their salt could be expected to know, their galactic homeland notwithstanding.

> **". . . our search for messages in the electromagnetic noise from the cosmos may not be so foolhardy after all."**

Lest this speculation seem altogether far-fetched, you can bet your boots that we and our terrestrial adversary have made a measure of progress in extracting data from each other's spread-spectrum communications. Also, consider the prospects of our present efforts in trying to detect a narrowband signal from an extraterrestrial. The probability of success may be quite close to zero because of rf pollution here on Earth. Also, we would *still* be faced with the problem of recognizing a modulated signal as such and then interpreting the logic contained in it.

The prospects of our finding a narrowband signal in the vast sea of QRM and QRN is not too rosy, and the extraterrestrial may well be aware of it. It is not at all unreasonable to suspect that the extraterrestrial might elect to conduct his probes with a spread-spectrum signal. For then, his QRZ or CQ might be fished right out of the prevailing noise level by us earthlings, who would be spared the Herculean task of shifting through millions of discrete frequencies.

Who knows? A broadband chunk of galactic noise may be coherent communications when properly processed. Most of us have been so thoroughly conditioned to the ongoing objective of *reducing* bandwidth that the concept of sending data by *simulating* the noise spectrum is, admittedly, a bit hard to swallow!

Kick the Noise Around

Manipulated noise from space—pro and con.

In the spirit of fairness and objectivity, I feel compelled to play devil's advocate and argue against the idea that signals from other worlds might use spread-spectrum modulation formats—or something akin to it. To my mind, the strongest argument against this hy-

pothesis is that we could not be expected to know their pseudo-noise code. Therefore, their signals would appear to be just some more galactic noise.

Also, let us not forget that such a space signal may not necessarily be targeted at this inconsequential planet of the solar system. Rather, we may be intercepting some leakage radiation from a private QSO between some neighbor galaxies.

Having given the devil his due, let's now reason out our prospects of recognizing meaningful modulation amidst a sea of random noise. Even though we might not know the full nature of the code, it is not altogether unlikely that our mathematicians and statisticians could differentiate between true background noise and the somewhat more periodical and organized sequence of pulses comprising the signal. Although we would not immediately know what was being said, there might be strong suggestive evidence that someone out there was, indeed, saying something.

Why not assume that the coding would somehow make use of universal constants such as pi and epsilon? Such an assumption surely is not unlike the present one that the extraterrestrial would select a narrowband carrier at or near the 21-cm wavelength of atomic hydrogen. Both assumptions would seem to be predicated upon the suspected evolutionary status of our intelligence.

Admittedly, spread-spectrum or similar ultra-wideband modulation techniques would *not* solve the vexing problem of propagation time—two-way QSOs don't seem too practical. But one step at a time; the first order of the day is to find out if there is (or was) somebody out there!

Noise by the Numbers

Seeking messages in noisy numbers.

Throughout the ages people have sought meaning in numbers. In particular, it has been felt that there was logic concealed in apparent randomness. Who hasn't encountered the entertainer or jokester at a party who purports to uncover some vital statistic about one from the appropriate jumbling of telephone numbers, the month of birth, the number of siblings, and any number of unrelated (?) numerical data? Even after unraveling the underlying trick, it is only natural to speculate whether the numbers pertaining to various aspects of our lives do, indeed, relate to our identity, status, and fate. Even those of us with "scientific" minds are sometimes uncertain where the line of demarcation is between hogwash and objectivity.

As an example of this, mathematicians continue to seek significance in the apparently never-ending decimal sequence of pi—the relationship between the diameter and circumference of a circle. Although the modern computer can spit out pi to a million decimal places, there remains no hint that this "exact" ratio will ever prove to be anything but an infinite series.

Yet, there appear to be clues that the pattern is something more than randomly occurring numbers. This is not, strictly speaking, mathematical. On the other hand, it is too fortuitous to be labeled coincidental. Nor is the "magical" allusion satisfying. It certainly seems that an apparent hodgepodge of digits is used by nature to harbor patterns, logic, and meaning. Assuming such to be the case, our search for messages in the electromagnetic noise from the cosmos may not be so foolhardy after all.

Concluding Thoughts

The basic theme of this exercise of the imagination is that there may be logic and intelligence in what we blandly describe as noise, as randomness in the electromagnetic spectrum. Just as some scientists now think that energy may reside even in a "pure" vacuum, messages in the form of communications and/or guidance could conceivably be contained in the cosmic radiation that permeates the universe.

Such speculation relevantly relates to the whole gamut of mankind's intellectual probings, including cosmology, theology, biology, chemistry, evolution, and communications. It also whets the thinking of those dealing with science fiction, science fantasy, and future trends of technology.

Admittedly, the transition from extrapolation to fantasy may have been crossed in some instances, but innovation, creativity, and discovery stem as much from wild as from disciplined thought processes. Indeed, the difference between the acceptable and the unbelievable is often fuzzy and unclear. Even though we continue ruthlessly to root it out of our communications systems, it is hoped that noise spectra will merit a bit more respect and dignity than it has hitherto been accorded. ■

QRP

Number 24 on your Feedback card

Michael Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

OPERATING TECHNIQUES

I will try to tie up some loose ends this month. But before I get started, let me take time to discuss some QRP operating techniques.

For some strange reason, I decided to work the 1986 *CQ* WW DX contest. For a real challenge, I jumped in with both feet running SSB. So there I sat, running 2 Watts PEP output into a tri-band beam up about 40 feet. Not exactly a rock-crushing station. I figured I could work a few new ones, and a new one to me is Delaware! So for what it is worth, here are some good QRP operating tips you can put to use. Even if you're not running low power, these tips may help your overall operating.

So let's start. The old statement "You can't work 'em if you can't hear 'em" still holds true. However, running low power requires far better listening and more of it. Before you even think about pushing the microphone button, listen to the stations that are being worked. Are they on EXACTLY the same frequency as the DX station, or are they over to one side of zero beat? While this may sound unimportant, it may make the difference between a contact and an empty log book.

If the DX station constantly answers stations to one side of his frequency, you'd better get on that side before you call. Just as important, does the DX station answer the first call in the pileup or the stations that are calling last? If he is waiting for the tail enders, pause a second, then give your call.

Here is a second good operating tip. How is the operator on the DX side handling the pileup? Does he have the pileup under control, or is it a total mess? While I'm not much of a DX chaser myself, I can very easily tell the good operators from the bad. I like to hunt and peck when I chase DX in a contest. If I come up to a pileup in which the operator has control, I have a very good chance of getting heard with my 2 Watts. If the operator is not in control, with total mayhem on his frequency, I'll never be heard. I then just move on.

While tuning up and down the dial, I don't waste time on the stations that are running sections. With QRP power levels, the chances of getting heard within your section are slim. You then have to wait till your section comes around once again. The QRP operator has a better chance calling with everyone else.

During the contest, I was tuning around on ten meters when I came upon 3G3DX. Here was this station running herd on the W/K stations. I tried several times and could not seem to break the pileup. All of a sudden, 3G3DX stopped and asked that only QRP stations come back. Well, I'm impressed! My hat goes off to him. No, he did not hear me, but I did get a good break. I must not forget all the other higher-powered stations that did wait till he worked some of my QRP brethren. As for the few who took advantage of the QRP standbys, beware!

Listen and follow the instructions the DX station operator may be giving out. If he asks that only the last two letters of your call be given, then that's what you do.

Keep an eye and ear on how the bands are running. If the DX station is only S3, and assuming propagation is equal in both directions, your QRP signal will be almost unreadable. Remember, you will be about 3–4 S-units lower than a 100-Watt station. Call only the louder stations first, then try your hand at some of the weaker ones.

Try sending your call out only half a dozen times to one station. If you can be heard at all, that many times should do. After six tries, move around and try a second station. If you have no success, go back to the first station and start the tactic all over.

When you use SSB, your transceiver should be adjusted so the audio is crisp and clean. When signing your call, use the International Telecommunication Union Phonetics. Speak your call in a normal tone and speed. You're not out to break any speed contests. Don't waste your time adding QRP to the end of your call. It takes too long and more than likely will go unnoticed. Since I have a two-by-three call, I use only the last three letters, with special articulation on the last letter, "echo." Using this method, that "echo" has allowed me to work a few new DX countries.

By using these operating tips, I was able to work 68 countries in about eight hours of contesting. Yes, there were some stations that I thought I should have been able to work and didn't. There were also some stations that I worked on the second call, using my 2 Watts of power. Just remember, all these tips are just that, tips. Feel free to change them to suit your needs. Running QRP DX is truly "wits in place of Watts."

LOOSE ENDS

Now for those loose ends. Digging into the mail bag brings a letter from D. Paul Ridley KB5DQ, asking for help in modifications for the Ten-Tech Argonaut 505. I remember sometime back in *73 Magazine* an article on doing just that, but for the life of me I can't seem to find the issue. Perhaps someone may recall what issue it was in and let KB5DQ and me know. I purchased one of those critters at the Dayton Hamvention for $20. The guy who sold it to me said, "I'll send you the manual." I'm still waiting.

Mr. Ridley would also like to know if anyone still has copies of the old *Milliwatt* newsletters. I'd like to see some of those myself. If anyone does, I'll be happy to make copies of them and send them out to interested readers.

Bob Krieger KAØQHV writes to add a few more companies to the mail-order shopping guide. They are Digi-Key Corporation, PO Box 677, Thief River Falls MN 56701, and Dick Smith Electronics, PO Box 2249, Redwood CA 94064. Bob reports that both have fast service and low minimum orders. On the other hand, Bob tells me that he has had problems with Lolir Electronics and with Knapp-co Electronics of Florida. Just as I stated before in my Rules of Ten, these are only opinions. Make what you will out of the information.

There is quite a bit of interest in my WHD-40 transceiver plans. While I did send out what information I could, the cost of postage will drive me to the poor house. If I could only talk KW1O into a separate construction article for the project (hint, hint).

Speaking of postage, does anyone QSL anymore? I like to get cards from the different stations that I work, but the cost of mailing those cards, ouch! Some time ago, the USQS handled stateside and VE cards, but they went under. I would imagine from lack of support from the people using the QSL service. Not to see a good idea die, W. C. Wellborn K4CLA will offer the same incoming QSL service. The new service will be called KIQS (pronounced KICKS), which stands for K4CLA Incoming QSL Service. While I don't have the space here to print all the operating rules, here's the gist of things:

1) DX stations may send QSLs to U.S. homes via KIQS.

2) U.S. stations may send QSLs to other U.S. hams via KIQS.

3) Pre-sort QSLs numerically, then alphabetically by suffix.

4) One dollar is exchanged for four stamped envelopes of appropriate size, each bearing one ounce of postage.

Net	ORG	NCS	Day	Time (UTC)
TCN*	14.060	W5LXS	Sun	2300
SEN**	7.030	K3TKS	Wed†	0001
GSN	3.560		Thur†	0200
GLN	3.560	W3TS	Thur†	0200
WSN	3.558	NM7M W6RCP	Sat†	0200
NEN	7.040	W1FMR	Sat	1200
WSN	7.040	NM7M W6RCP	Sat	1600

*On weekends of major contests, net will meet one hour later.
**If conditions on 7.030 MHz are poor, QSY to 3.535 MHz at 0031 UTC.
†Evening of day before of W/VE.

Table 1. QRP net schedule.

5) If you have a card waiting and no envelopes, then notices will be sent as routine traffic via ham radio.

6) Do NOT send SASEs. They will not be accepted.

All this sounds like a good idea to me. For correspondence, QSLs, comments, and criticism, drop a letter off to KIQS-K4CLA, 562 Oak Drive, Lexington SC 29072. As QRP operators, let's get behind this project and give it support. I will.

A lot of the letters that I have received ask for information about awards for the QRP operator. Sometime in the future I'll do a column on the QRP ARCI. For now, for more information about the awards the club does offer, write to Awards Manager, Fred Turpin K6MDJ, PO Box 145, Cedarpines Park CA 92322. I'm sure that Fred will be able to fill you in as to the most recent awards the club is giving out.

The weather gets rather cold here in Ohio this time of the year. So what better time to try checking into the many QRP nets. They include the Transcontinental Net (TCN), the Southeast Net (SEN), the Great Lakes Net (GLN), the Gulf States Net (GSN), the Northeast Net (NEN), and the Western States Net (WSN). Nets are listed by day and hour (UTC) in Table 1. Make some friends and drop by to say "hello."

If checking into nets is not your thing, and the soldering iron is still hot, how about doing some modifications to the ol' Heath HW-8? Yes, you say, great idea. Where do I start? Well, first things first. Order a copy of the *Hot Water Handbook* from me. They go for $5 postpaid first-class mail in the U.S. and for $7 for DX airmail. The book contains more than 30 pages of modifications for the HW-7, HW-8, and HW-9.

I enjoy all the kind words that you have been sending me. Remember, it's your column; you supply the feedback that I need. Thanks also for the schematics, photographs, and information on the different circuits. I'll try to get some of them printed here in the QRP column.

That's about all I have space for this month. Next month, I'll scoop everyone with a lineup of QRP activity at the Dayton Hamvention. ■

ABOVE AND BEYOND

Number 13 on your Feedback card

Peter H. Putman KT2B
84 Burnham Road
Morris Plains NJ 07950

Last month I discussed important parameters to consider when selecting a preamplifier for VHF and UHF applications, specifically MDS (minimum discernible signal), IMD (intermodulation distortion), gain, and 1-dB compression point. All are interrelated, especially the latter three. Excessive gain can result in poor IMD performance and a low 1-dB compression figure. Conversely, a well-designed preamplifier may not have a very high gain figure, but will excel in the IMD and 1-dB COMP tests.

Note that we also have to take noise figure into consideration, especially at frequencies above 220 MHz. Below this frequency, the limiting factor is the ambient noise level on the band in question. To have a 144-MHz GaAsFET preamplifier with a noise figure under .5 dB is great, except that the atmospheric noise present on two meters might be 2 dB, so you haven't gained much of anything there.

At 432 MHz, device noise can be substantially higher than ambient band noise. Here is where noise figure really becomes important, for if a given preamplifier has a 2+ dB noise figure—not uncommon for a microwave bipolar transistor—it might not help you copy that really weak signal just above the ambient band noise level. It goes without saying that low noise figure is paramount at 902, 1296, and 2304 MHz; otherwise, communications could be impossible.

Noise figure measurements require special equipment, typically a noise figure meter such as that made by Hewlett-Packard. Such instruments can establish a noise baseline for a given frequency and measure any additional noise generated by a preamplifier at that specific frequency. MDS measurements are also very difficult to make unless you have access to an accurate spectrum analyzer covering the desired frequency range and a calibrated signal generator.

On the other hand, it isn't all that hard to make gain and compression measurements, and test equipment can be had cheaply to do the job. I've long relied on the standard Boonton Electronics model 92 rf millivoltmeter for precision measurements of low signal levels. Its displayed range is from −60 dBm to +23 dBm using eight switch-selected sensitivity settings. The standard rf detector is good to 600 MHz and, best of all, these units can be found at flea markets and surplus auctions for a few hundred dollars.

You'll also need a signal generator, and these are in abundance at auctions and surplus test equipment dealers. I recently purchased a Hewlett-Packard model 608F rf signal generator from Brian Kent of Kentronix (PO Box 2444, Allaire Airport, Farmingdale NJ 07727) in very good condition for about $300. This generator was long a mainstay in many service shops for both commercial and military work. It features a pencil triode oscillator, which is quite stable, and covers 10–450 MHz in six ranges. The output is variable from .1 uV up to 500 mV with a precision piston-type attenuator, and is easily calibrated with the built-in level tracking feature. (This latter option keeps the output constant as you move across a given frequency range.) Provision has also been made for connection to an external precision frequency reference—just like a vco (voltage-controlled oscillator) in a PLL (phase-locked-loop) circuit.

With such a generator, you can measure receiver sensitivity, preamplifier gain, selectivity, squelch law, and quieting levels (FM receivers only), i-f and filter bandwidths, and many other things. A signal generator might be one of the most useful items you can keep around the shack! So I decided to take the plunge and carted home the 608F (in a rack-mounted version, I might add). The manual was included in the price and is quite helpful, so try to locate one if you purchase such a unit.

Now, on to the actual measurement procedure. I selected four representative preamplifiers to demonstrate this process: (1) Janel Laboratories 50 PB 50-MHz MOSFET preamp; (2) Microwave Modules MMG144 144-MHz GaAsFET preamp; (3) Advanced Receiver Research 220VDA 220-MHz MOSFET preamp; (4) Advanced Receiver Research 432VDG GaAsFET preamp. The 608F was turned on and allowed to warm up for about one hour. The Boonton 92 was employed to measure output. Photo A shows the HP-608F up and running, while Photo B shows the 220VDA under test. To make sure of the operating frequency, the 608F has a separate output marked "UNCAL RF OUTPUT" which should be connected to a frequency counter for precise frequency measurements. I used a Ramsey Electronics 600-MHz counter, which is quite stable and accurate.

Instead of mentioning the manufacturer's claimed specifications for each of the preamps, I'll list my measurements in Table 1. The results might surprise you.

In each case, I started with a −20-dBm signal, or slightly more than 20 millivolts. Remember that the 1-dB compression point occurs when the input level must increase by 2 dB to result in the same gain at the output. For example, with the 220VDA this occurred when an input signal of −16 dBm, or 35 millivolts, was injected. The measured output was +1 dBm, yielding a gain figure of 17 dB. Signals of less than −16 dBm showed a consistent figure of 18 dB of gain as measured on the Boonton 92.

At this level, the preamplifier was saturated and going into compression. This is considered to be the point at which distortion products appear in the preamplifier's output—when it is no longer operating in a linear fashion. Spurious signals are generated along with the amplified signal, and IMD performance is degraded.

Note that both the Janel 50 PB and ARR 432VDG have very high compression points at +7 and +9 dBm, respectively. These preamps could no doubt be called "high-performance" and would work well in high rf density environments. The performance of the 220VDA is adequate, as is the MMG144 at +2 dBm. Incidentally, you should expect to see better than 0-dBm compression points

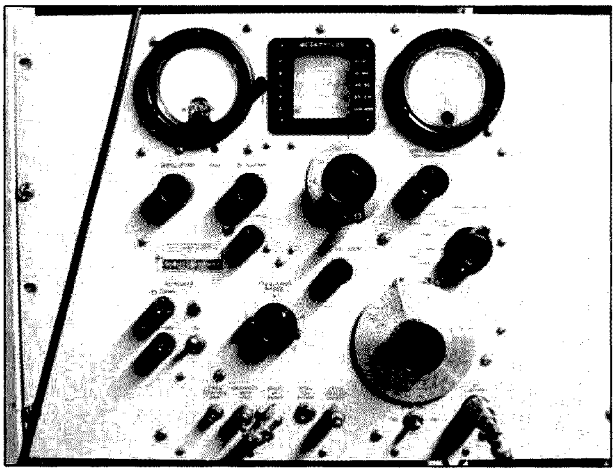

Photo A. Hewlett-Packard 608F signal generator in operation.

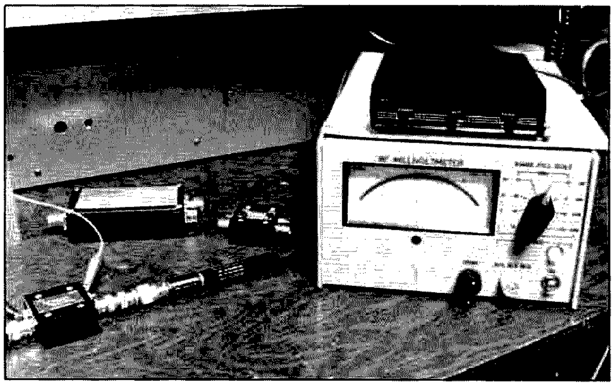

Photo B. 220VDA preamplifier under test with Ramsey counter and Boonton 92 millivoltmeter.

Model	Gain	1-dB COMP
Janel 50 PB	23 dB	+7 dBm
MM 144 VG	15 dB	+2 dBm
ARR 220VDA	18 dB	+1 dBm
ARR 432VDG	16 dB	+9 dBm

Table 1. Preamplifier measurements.

on any well-designed preamplifier! Avoid those units that cannot meet this specification, especially if you live in a high-rf area or do a fair amount of contesting.

In reviewing the measured data, it's interesting to note that the ARR 432VDG can accept a signal almost ten times stronger than the 220VDA before it goes into compression. The 23-dB gain figure for the 50 PB might sound a bit fantastic, but remember that the circuit employs a 3N204 MOSFET at 50 MHz, where gain and performance are a bit easier to come by. The compromise at higher frequencies is generally to run the semiconductor device throttled back a bit to improve the linearity. Many imported preamplifiers run excessive gain and "crunch up" easily as a result. A test I performed some months ago on an imported 220-MHz preamp showed almost 22 dB of gain but a 1-dB compression point of only −4.5 dBm, which is pretty poor performance. Sure enough, on-air tests showed all kinds of spurious mixing products from nearby channel 13 in New York City, making the preamp all but useless for weak-signal work.

Remember also that when you drive a high-gain preamplifier into the front end of your multimode or transverter, you could be exceeding the compression point of that radio's first rf stage! A sure sign of this is the presence of spurs up and down the band as well as strong local television or FM station signals punching through where they shouldn't be. It's good to keep some low-loss precision fixed attenuators on hand to put between the preamp and your VHF radio receiver input. Such attenuators are inexpensive and can be found at flea markets.

Other Handy Items

While at Kentronix, I also purchased another useful item common at flea markets: a Kay Electronics precision step attenuator, giving 101 dB total of attenuation using toggle switches in 1-, 2-, 5-, 10-, and 20-dB steps.

The attenuator is useful if you have access to only a low-level signal source other than a variable signal generator. Such a low-level source might be your two-meter hand-held in the low-power position! Since most hand-helds run under 500 milliwatts in low power, they make excellent signal sources for 144-, 220-, and 432-MHz measurements. The trick is knowing exactly how much power your hand-held puts out, and you'll have to make that initial measurement on some sort of calibrated lab equipment, or a commercially made low-power wattmeter. SSB Electronics makes a good low-power absorption-type meter for 50–1300 MHz with readings as low as 25 milliwatts.

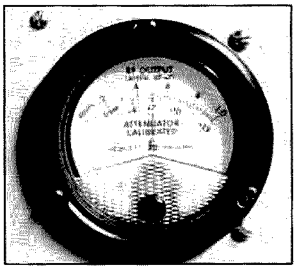

Photo C. Close-up of leveling indicator on HP-608F. Output will remain constant from 10 MHz to 450 MHz.

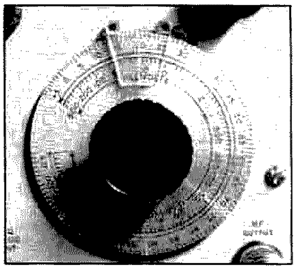

Photo D. Close-up of calibrated attenuator (piston-type) on the HP-608F.

Since the Kay attenuator allows 1-dB steps through 101 dB, the combination of it and your hand-held gives you a fairly accurate signal generator! (And it's cheap, too.) I use it in exactly that mode when I need a quick and dirty signal source for 2 meters, employing my IC-2AT at low power at 150 mW. Thus, starting with a signal of 150 mW, 101 dB of attenuation results in a signal of about 2 microvolts (uV). Add another 20–25 dB and you can get this down to under .1 uV, which is a very weak signal indeed. Receiver sensitivity can be figured quite accurately in this fashion, and if you can secure a millivoltmeter you can also make gain and compression tests with your hand-held.

That's it for this month. Hope some of you got on during the January VHF Sweepstakes to check out the station and make a few new grid-square contacts! I'll try to have a report in the April issue on my participation—wherever I wind up operating from! Until then, see you Above and Beyond! ■

NK6K > PACKET

Number 22 on your Feedback card

Harold Price NK6K
1211 Ford Avenue
Redondo Beach CA 90278

HEADER WARS

There is a lot going on in packet this month, but unfortunately, most of it can be classified as short-lived phenomena. That's the type of thing where there is a lot of arguing going on now, but the fight will be over within a month ("now" equals mid December). If I write it up now, you won't see it until February, and you either won't care or it could start up the controversy all over again. Now I'm not one to stir up controversy for controversy's sake. . . but wait a minute, didn't I read something in "Wayne's Secrets to Success". . . yep, here it is—Rule 1: Be controversial. OK, here we go with "The Great Header War."

Because the fighting will hopefully be over by the time you read this, I'll fill you in on the background and why the issue is important. "Headers" refer to the information added to the front of a message as it is forwarded from one WØRLI (or compatible) BBS to another. These headers show the path the message took through the network. A sample set of headers is shown in Fig. 1.

Everyone has an opinion about headers. Each BBS operator (sysop) gets to specify what his header will look like. His personalized header will be placed at the front of every message that gets forwarded through his BBS. Some sysops like to see everything but the kitchen sink in the header. Here are some of the things I've seen in headers, ranked in no particular order:

1) Callsign of the BBS, with and without SSID.

2) Callsign of the originator of the message being forwarded.

3) Time and date that the message was received.

4) Time and date that the message was forwarded.

5) Time zone indicator—UTC, Z, EST, etc.

6) BBS's QTH given as city/state, grid square, latitude/longitude, or area (Balto/Wash or SoCal, for example).

7) Frequency(s) used by the BBS.

8) The serial number of the message.

9) Any number of other personalizing notations.

With the possible exception of #4 (which can be assumed to be the same as the time the message was received at the next station) and #9, all of the above information can be useful to those who are trying to maintain the network. The headers serve to specify the backward path that the BBS operator at the receiving end must establish if he wants his users to be able to send replies in the other direction. In today's network, all of the routes are built by hand. Each sysop manually builds a list of BBS stations and how to forward to them.

For some BBS sysops, this is an easy job. They have only one other BBS that they can connect to, so traffic to any BBS but their own must obviously go to that other BBS. Some BBS operators can hit several other BBS stations, each of which has a set of BBSs they in turn can hit. Life is harder for these sysops.

Life is hardest of all for sysops who are in the same path as a prolific message sender. For example, WB6KAJ is right next to NK6K, and NK6K has sent a lot of traffic lately due to the packet poll. Almost all of the acknowledgments of poll responses that have

```
Msg# TR  Size To      From    @ BBS  Date   Title
2166  Y  1149 NK6K    N3BHA   NK6K   861202 packet survey response

R:861202/0436  S:861202/0540  WB7BNI #845 Phoenix, Arizona.
R:861202/1133z S:861202/1139z KE7CZ Dewey, Arizona (HF/145.01)
R:861202/1100z S:861202/1127z #6936 Via CENTEX Gateway W5XO Gause,Texas
N3BHA /W2HPM/11/Farmingville/NY/8612020523/r
N3BHA /W2JUP-4/5471/Farmingville/NY/8612020224/r
N3BHA /WA2SNA-1/ 4873/Hawthorne/NJ/8612020636z
Via WB2RVX: 1238 From N3BHA Rcvd 861130/0858z, Sent 861202/0639z
R:861130/0805z S:861130/0857z W3IWI # 6462 Balto/Wash [145.01/221.01]
R:861130/0441z S:861130/0730z K4NGC Woodbridge, VA (145.01/07)
R:861129/2117z S:861130/0513z WD4HXG   STERLING, VIRGINIA
<message  follows>
```

Fig. 1. The headers from a forwarded message.

```
From ihnp4!hoptoad!gnu@wbux2.UUCP Sat Dec  6 15:04:08 1986
Received: by ka9q.ampr.net (5.54/4.7)
id AA00919; Sat, 6 Dec 86 15:04:00 EST
Received: by sabre.bellcore.com;id 8612040158.AA07267
Received: by ihnp4.ATT.COM id AA16310; 2 Dec 86 08:24:58 CST (Tue)
Received: by hoptoad.uucp (1.1/SMI-3.0DEV3)
id AA01810; Tue, 2 Dec 86 04:54:05 PST
Date: Tue, 2 Dec 86 04:54:05 PST
From: hoptoad!gnu@ihnp4.UUCP (John Gilmore)
Message-Id: <8612021254.AA01810@hoptoad.uucp>
To: karn@ka9q.bellcore.com
Subject: Re: NK6K Packet Survey
In-Reply-To: your article <199@ka9q.bellcore.com>
Status: RO
```

Fig. 2. Headers from an ARPA mail message forwarded via KA9Q.

been sent from NK6K have gone out through WB6KAJ. There are 123 different BBS systems that I have sent messages to through WB6KAJ at some time in the past few months. Keeping track of all that by hand is a non-trivial task.

The first thought is to have your computer keep track of all this for you, right? It should be a simple task to look at the header in each message as it goes by, figure out the backward path, and update the routing file, shouldn't it? Well, it should be, but look again at Fig. 1. There are almost as many different combinations of information and methods of including it as there are headers. Writing a program to decode all that isn't easy, and wouldn't be reliable since sysops think up new formats every day.

You should now be able to see why the information is needed and why, even though it is there, it isn't readily accessible. Unless everyone includes a minimum subset of the needed data and presents that part of it in exactly the same way, we can't automate the route-building part of the network any time soon.

Until the headers are standardized, we can't solve a common user complaint either: "How come I have to look at 800 characters of trash to see a 40-character Happy Holidays message?" Since the headers are of primary importance to the sysop and only of secondary importance to the end user, many users have asked for a way to have the BBS strip off the "trash." Until there is a standard header format, there is no reliable way to separate headers from the message.

In the meantime, in November at least, sysops have been getting messages from other sysops, some threatening hellfire and damnation (or at least a pink slip from the FCC) if certain information wasn't added to the header. Other messages point out how messy your header looks and how you should clean up your act and align your fields. Others berate you as a channel hog for having too much information in your header (the same stuff that the first message told you to put in). It's always something. If you see messages coming to your local BBS with all the same header, you'll know that this problem worked itself out.

By the way, in case you thought this header business was unique to amateur radio, Fig. 2 shows the header lines from a poll response received in an ARPA mail message via a "real" network.

The Great Poll of 1988

As I write this, "the poll" continues to clog the airwaves. If you just got your subscription for Christmas, the December packet column featured a 46-question poll. I also made the questions available on a few packet and phone BBS systems. Respondents were encouraged to send the answers in via packet radio. The poll prompted even more response than I had hoped for. I've had 350 responses in the first three weeks. By the time you read this, responses will hopefully have dropped to a trickle, and I can begin analyzing the results. I'd like to get the numbers and commentary in the March *73*, but that may be pushing it.

Even though I haven't looked at the specific answers, the poll has already revealed a great deal. First, with the help of other interested hams and with no prompting on my part, the poll has found its way into a variety of other systems. Some analysis of the header information of the poll results not marked as "saw it in *73*" will tell us exactly how fast the word carried: It seems that we can get information dispersed to many parts of North America in a short time.

Next it shows that the ad hoc forwarding network, non-optimal as it is, can carry a worthwhile amount of data: 223,000 characters of information have come in already, with probably another 150,000 going out from me (mostly headers on short thank you messages). All this, in addition to the hundreds of other messages carried by the same network each day. Many of the messages came in via HF, which is not available 24 hours a day.

The large amount of messages sent to a single point has also pointed out some problems with the way we're doing things now. For example, when the local 14.109 HF forwarding node shut down as the control op left for the Thanksgiving holidays, messages to me were sent on some amazing journeys as systems and sysops tried to route around a down path. Messages originated in New England would bounce from the Midwest to Florida to Texas to Maryland trying to get to the West Coast. As the network gets smarter (or we do), these problems will diminish. I'll be making the raw header information available to those who want to do traffic analysis. Look for details when the poll results are announced.

Before I leave the subject of the poll, there were many comments along with the responses, both about the poll and about packet radio. I'll be putting some of those in the column as space permits in the months ahead. Thanks to everyone a month early, and especially to the forwarding BBS sysops who put up with all the extra traffic.

Pet Peeve

The one common "fault" I found in the messages as they came in was that some people never seem to enter a carriage return character <cr> when they enter text messages. They just keep typing. Either they have a program that wraps words on their screen or they don't worry about words split across line boundaries. While this can be less than pleasing visually for the guy on the receiving end, it causes problems for many software packages, and that's my major concern.

Most software deals in "lines." A line of data consists of the characters between one <cr> and the next. There will be a place in the program that says "read next line," where "line" is defined to be a buffer of some maximum size. This is sometimes 80, sometimes 140, sometimes 255 characters, but it is rarely infinite. When you enter a message and don't enter a <cr>, the whole message appears as one line. While it will wrap around to the

next physical line on most screens or printers, some programs will just toss out the characters that come after its internal line length.

This is usually a bad thing. For example, I've been taking the poll responses out of the BBS and putting them into separate files. I then read them into a larger file and do whatever cleanup is necessary with an editor. That editor has a nasty habit of tossing out anything past the 144th character on the line without so much as a by-your-leave. There are lots of ways around this little problem, of course, but the point is that during the formative phases of our network, it's nice to throw in a <cr> once in a while. Opposing viewpoints are welcome.

HF Life Above 20 Meters?

One of these days, we're going to see sunspot activity pick up again, and the HF bands above 20 meters will be useful for longer periods of time. Some packeteers are getting ready now. Here's a message sent to me by Ray WA6OWM:

"I have been on 28.093 and 21.093 the last three days from 1800–2400 UTC. Tuesday, 11/26/86, was the best day for 10 meters. Worked 10 stations in the following states: FL, PA, NH, KY, and AR. 15 meters has been a bit better, only because propagation hits that band twice during the period. Lots of fun for those on. I also run a Propagation Forecast Program, Minimuf, from *QST*, December, 1983. Openings to each station correspond to Minimuf, within 3 MHz. So far no DXCC stations. Through the winter I'll leave a beacon on 28.093 for those interested. Pat KR5S and I ran some tests on 3.636 MHz last night. Signals were 10 to 20 dB over S9, but noise was bad (S7 to S9 level). Caused signals to be somewhat distorted."

TEXNET

As I wrote last month, I went to the AMSAT general meeting in Dallas. While there, I was asked if I wanted to see a running TEXNET node. TEXNET is a network protocol that has been in development for a year or more in the Dallas area. I predicted a while ago that they would be the first people up and running with more than just one or two connected nodes because they weren't spending time trying to convert anyone to their way of thinking; they were just getting on with the implementation. Well, they are up and running with four or more nodes in the Dallas area. But I think it's time they came out of the back room and told the rest of us what's up.

As I was saying, I was asked if I wanted to see a running node, and I said, "Sure." While I was not quite blindfolded, two of them, one techie and one muscle-type, did take me outside and on a furtive quarter-mile hike through a parking lot. In the very last row was a nondescript hatchback with some equipment hidden under a sheet. They told me to get in. The sheet was removed and tacked up over the windows even though it was at least 105 degrees in there. The techie got in with me while the muscle stepped back to keep an eye on things. This is all true. Really! I was then handed a laptop computer and given instructions on how to access the local TEXNET node.

I connected a standard AX.25 TNC to the node, and then talked to that node to issue a second connect request to establish a path to another user through a second TEXNET node. The node I was connected to used a homegrown datagram protocol to converse with the other nodes. In a moment, a regular AX.25 connection was established between the distant TEXNET node and the user I wanted to talk to. From that point on, my local node acked packets from my TNC, and the other user's local node acked his packets. Getting packets between the two nodes was handled by the TEXNET protocol.

They also showed me a conference bridge. Several users can establish a regular AX.25 connection to the bridge; the conference bridge routes each data packet to all of the other connected users so that everyone sees what everyone else sees. Everyone sends to the bridge and gets his acks from the bridge.

After about 10 minutes, the sheet was pulled back over the gear, and I walked the quarter mile back to the hotel alone. I'll try to get more information on all this, but in the meantime, if you know a Texan, try to pressure him to publish.

Last month, I was on my way to Boston. I didn't sleep that night. Tomorrow I have to go to San Jose, but this time I started writing earlier in the day. Next month, packet poll results, maybe. ■

SPECIAL EVENTS

MARSHALL ISLANDS
JAN 31–FEB 9

The Kwajalein ARC will operate KX6BU from 0600 UTC January 31 until 0600 UTC February 9 to commemorate the 43rd anniversary of the Battle of Kwajalein and Roi-Namur. Frequencies: SSB—14.250, 21.350, 28.550; CW—7.025, 14.050, 28.050. For $6, KX6BU will issue a QSL, certificate, and a 64-page book on the battles of Kwajalein and Roi-Namur. Three dollars will bring the QSL and certificate. Send all requests to KX6BU, Box 444, APO San Francisco 96555-0008.

CLARK GABLE BIRTHPLACE
FEB 1

The Harrison ARC will operate special-event station N8TF on February 1 from the birthplace of Clark Gable. SSB operation will be on approximately 3.875 and 7.230 MHz from 1400–2200 UTC. For a special QSL, send QSL and SASE to KC8XS, PO Box 362, Cadiz OH 43907.

GROUNDHOG DAY 100TH
FEB 1–2

The Punxsutawney ARC will hold a special event on February 1 and 2 to commemorate the 100th anniversary of Groundhog Day. Special-event station W3QOS will operate on February 1, from 1300 to 2200 UTC, on 14.235 and 7.235. Special-event station K3HWJ will operate on February 2, from 1300 to 2200 UTC, on 7.235. Certificate for SASE to W3QOS, PO Box 20, Big Run PA 15715.

W. CANADA WINTER CARNIVAL
FEB 6–15

The North Okanagan RAC will operate special-event station VE7NOR on February 6–15 to commemorate western Canada's largest winter carnival. Frequency: 14.230 every afternoon. For a commemorative certificate and QSL, send log info and $1 or two IRCs to NORAC, Box 1706, Vernon BC V1T 8C3, Canada.

TRAVERSE CITY MI
FEB 14

The Cherryland ARC will hold its 14th annual Swap N Shop on February 14, from 8 a.m. to 2:30 p.m., at the Immaculate Conception Middle School gymnasium, 218 Vine Street, Traverse City, Michigan. Admission $2.50, tables $3 each. Talk-in on .52 and 146.85. For more information, contact Mick Glasser N8DBK, 4102 Peninsular Shrs. Drive, Grawn MI 49637; (616)-276-9203.

MANSFIELD OH
FEB 15

The Mansfield Mid-Winter Hamfest/Compter Show will be held on February 15, beginning at 7 a.m., at the Richland County Fairgrounds in Mansfield, Ohio. Tickets $3 in advance and $4 at the door. Tables $5 in advance and $6 at the door. Half tables are available. Talk-in on 146.34/.94. Advanced ticket/table orders must be received and paid by February 5. For additional information or advanced tickets/tables, send SASE to Dean Wrasse KB8MG, 1094 Beal Road, Mansfield OH 44905, or phone (419)-589-2415 after 4 p.m. EST.

LONG ISLAND NY
FEB 15

LIMARC will sponsor the Long Island ARRL indoor hamfest on February 15, beginning at 9 a.m., at the Electricians Hall, 41 Pine Lawn Road, Melville, Long Island, New York (at Exit 49, north of the LIE, go north a block to Pine Lawn Road, turn right to site). Admission for buyers is $4 at the door and $3.25 in advance with SASE (checks to: LIMARC Tickets, Mark Nadel NK2T, 22 Springtime Lane East, Levittown NY 11756 by February 5). Sellers: 4' x 6' tables are $12 each or bring your own at $1.50 a foot with an $8 minimum. Each table sale admits one person, additional workers at $3.25 each (checks and reservations to: Hank Wener WB2ALW, 53 Sherrard Street, East Hills NY 11577). Make all checks payable to LIMARC. LIMARC VHF rig clinic will be on hand. For additional information, call Hank at night at (516)-484-4322.

LOST DUTCHMAN DAYS
FEB 20–21

In commemoration of Lost Dutchman Days, Superstition ARC is offering a certificate to those who work WB7TJD in the 40-, 15-, or 10-meter Novice bands, or in the lower end of the 40-, 20-, or 15-meter General phone bands on February 20–21. CW operators should listen for "CQ LDD." Hours are 1500–2400 UTC both days. Please QSL with either a 9 x 12 SASE with 29¢ postage or, if you don't mind it being folded, a business-size 22¢ SASE. Please include your QSO number on your QSL and mail to SARC, PO Box 1551, Apache Junction AZ 85217-1551.

SALEM OR
FEB 21

The Salem and Oregon Coast Emergency Repeater Associations will sponsor the 1987 Hamfair on February 21, beginning at 9 a.m., at the Polk County Fairgrounds. Admission is $4 in advance or $5 at the door. ARRL/VEC testing. Talk-in on 146.26/.86. For more information, write to Salem Repeater Association, PO Box 784, Salem OR 97308.

MEDINA MN
FEB 21

The Robbinsdale ARC will sponsor its 6th annual Mid-Winter Madness Hobby Electronics Show on February 21, from 8 a.m. to 2 p.m., at a new site, the Medina Ballroom, Hwy. 55, 3-1/2 miles west of 494, in Medina, Minnesota (western suburb of Minneapolis). Admission is $3 in advance, $4 at the door. $8 for 8-foot table (half tables for $4). FCC testing ($4) begins at 9 a.m., limited walk-ins. Talk-in on 147.00 and 146.52. To register, send SASE and fees to Robbinsdale ARC, PO Box 22613, Robbinsdale MN 55422, or call Bob at (612)-533-7354. Send exam registrations to Ron Schutz NAØU, 6308 Peacedale Avenue, Edina MN 55424 by January 21.

LIVONIA MI
FEB 22

The Livonia ARC will hold its 17th annual Swap 'N' Shop and Computerfest on February 22, from 8 a.m. to 4 p.m., at the Dearborn Civic Center in Dearborn, Michigan. ARRL/VEC FCC amateur examinations will be given by the Motor City Radio Club. Plenty of tables are available. Reserved table space of 8-foot minimum available. Talk-in on 144.75/5.35 and 146.52. For further information, send a 4 x 9 SASE to Neil Coffin WA8GWL, c/o the Livonia Amateur Radio Club, PO Box 2111, Livonia MI 48151.

CUYAHOGA FALLS OH
FEB 22

The Cuyahoga Falls ARC will sponsor its 33rd annual Auction-Fest on February 22 at the Tallmadge High School (1 mile east of Tallmadge Circle on East Avenue or 2.3 miles west of I-76 at Exit 31). Flea market opens at 8 a.m. and the auction begins at 11 a.m. Admission is $4 at the door and $3 in advance. Flea market tables available for $6 in advance. Deadline for tables is February 9. Talk-in on 147.87/.27. For more information, send an SASE to Cuyahoga Falls Amateur Radio Club, PO Box 614, Cuyahoga Falls OH 44222.

BROOKSVILLE FL
FEB 28

The Hernando County ARA will hold a hamfest on February 28 at 205 Alpine Street, Brooksville, Florida. Admission is $3 at the door, $2 in advance. Swap tables cost $6. Send check and SASE to PO Box 1721, Brooksville FL 33512. Examiners will be present to give Technician- through Extra-class licenses. Talk-in on 146.715. For more information, write to the above address or call (904)-796-4840.

NORWICH CT
FEB 28

The Radio Amateur Society of Norwich is sponsoring an auction at the Montville VFW Hall. Directions: Rte. 395 to Exit 79 to Rte. 32N, about 1-1/2 miles to left at Raymond Hill Road, 1/4 mile on right in back of the Wonder Bread Store. Talk-in on 146.730/146.130. Set up at 9 a.m. The gavel drops at 10 a.m. Contact KA1IFG at (203)-846-9670 for more information.

PLAINWELL MI
MAR 1

The 1st annual State Technical Institute Hamfest will be held on March 1, from 8 a.m. to 4 p.m., at the school grounds at 33 Alber Drive, Plainwell, Michigan (located 15 miles northeast of Plainwell on Pine Lake). Admission is $2. Single tables $3. VEC examinations given. Talk-in on 146.46. For information and table reservations, write to Robert Mousseau KA8VVM, State Technical Institute, 33 Alber Drive, Plainwell MI 49080, or call the school at (616)-664-4461.

WINCHESTER IN
MAR 1

The Randolph ARA will sponsor the Randolph Amateur Radio Hamfest on March 1, from 8 a.m. to 3 p.m., at the Winchester National Guard Armory. Admission is $3 in advance, $4 at the door. Children 12 and under free with adult. 3' x 8' table space $5 (tables limited); space only, $3. Electronics and amateur radio exams. Talk-in on .90/.30 and 224.90/223.30. For more information, contact RARA, c/o Kedrick Robbins W9QUH, Rte. 1, Box 389, Parker City IN 47368; (317)-468-6568, or Jake Life W9VJX, 407 High Street, Winchester IN 47394; (317)-584-9361.

ATV

Number 14 on your Feedback card

Mike Stone WB0QCD
PO Box H
Lowden IA 52255

NEW *73/SPEC-COM* WAS SSTV CONTEST FEB. 23–MAR. 1

Let's get slow-scan TV moving again! This past fall and winter have taken their toll, with low activity levels on SSTV around 14.230 MHz and elsewhere. Today's modern-style color converters have discouraged some black-and-white operators from staying active.

With spring just around the corner, the *Spec-Com Journal* will be sponsoring its annual Worked All States SSTV Contest, the only regularly sponsored SSTV contest by any video group for many years. The 1987 WAS Contest will be jointly supported by *73* Magazine and *Spec-Com* for the biggest anticipated turnout ever.

The week-long contest operating period will allow contestants to send pictures of themselves and their shacks and to "enjoy" each visual exchange, rather than fighting for a quick contact and proceeding on to the next station, as is usually the case in 24- or 48-hour weekend contests.

Contest Specifications

1) Work as many U.S. slow-scan TV stations as possible on HF or VHF during the week-long period from 0001 UTC February 23 to 2400 UTC March 1, 1987. The idea is to work all 48 continental U.S. states plus three U.S. possessions.

2) Each initial contact with one of the continental 48 states gives you 100 bonus points. An extra 50 points is awarded for *color* two-way contacts.

3) Contacts with Alaska, Hawaii, and Puerto Rico receive an additional 500 points.

4) Only one contact per station is allowed on the entry form.

5) SSTV picture contacts may be initiated by SSB voice, but the sending station's callsign and RSV signal report must be in true video (analog) format to qualify as a legitimate contact.

6) Keyboard- or computer-generated graphics are acceptable for giving ID and signal-report information.

7) Any SSTV picture mode speed format may be used, such as 8, 12, 17, 24, 25.5, 34, 36, or 72 seconds.

8) High resolution is recommended, but not mandatory for point scoring.

9) Use standard SSTV operating areas on all available bands (28.680, 21.340, 14.230, 7.220, 3.845, etc.). The use of SSTV on 160 meters is now legal. Please avoid the Saturday afternoon 14.230-MHz W1JKF/W9NTP International SSTV Net at 1800 UTC, except perhaps to make short voice contacts with another station in a needed state via Net Control and to QSY to another frequency at the conclusion of the net. Operating on 14.230 to 14.240 is recommended during this contest.

10) Include on your log sheet: Your station callsign and operator name; a list of states in alphabetical order (including Puerto Rico), followed by the callsigns and dates of contact of stations worked from that state; and the number of states worked, the band used, and your final score.

Contest entries must be postmarked by March 10, 1987. Mail to: WAS SSTV Contest, PO Box H, Lowden IA 52255. The official results and standings will be jointly published in *73* and *Spec-Com Journal*. Certificates will be presented to all entrants and winners. A Worked All States SSTV Map will also be sent to you for two 22¢ stamps (no SASEs).

"Blow the dust off those P7 tubes, amigos, and let's hear some shrilling tones!"

ATV Fun

Fun, education, and fellowship—that's what our great hobby is all about, isn't it? It's certainly no less on the ATV modes. You can have a lot of fun DXing, or working on CW, RTTY, EME, OSCAR satellites, and packet radio—but how about one mode that has all these interesting traits and more?

On fast-scan UHF TV, you have all the thrills of DXing on 432 SSB or EME by making schedules and trying to work that fella three or four states away on your TV screen. The thrill I experience on each band opening when I see those first long-distance DX signal sync bars or a locked "viewable" picture hitting my antennas is simply indescribable!

The memories of watching powerful black-and-white and color TV signals coming from W9ZIH or N9AB out of the Chicago area some 180 miles away, or from K9WZB or W9NTP in Indiana. Or the exciting P3 pictures from WB8ELK and WB8ZAR in Ohio (more than 400 miles away!). Or getting that phone call late one summer night from Bill K9KKL in Springfield, Illinois, and then I turn on my TV set and see him closed-circuit on my screen. All these are etched in my circuit boards forever!

The times that Dave WB0ZJP in St. Louis, Missouri (250 miles), and I just sit in our chairs, having a good ole fashion rag-chew for several hours at a time "live and in color." The unprecedented 1 to 4 a.m. fascinating FSTV QSO with Jeff KA9TGX in Lafayette, Indiana—where we "waited out the band" and watched our initial P2 "two-way" pictures become absolutely P5; then we concluded our unique achievement by toasting each other with a "cold one" right on the tube, only to get a few hours of sleep and go back on at 7:30 a.m. to "see" each other off to work. Boy, what memories! All, of course, stored on videotape!

Seeing that first SSTV pic-

Photo A. VE6WSJ and VE6SL SSTV shack demonstration area. Photo by John VE6COD.

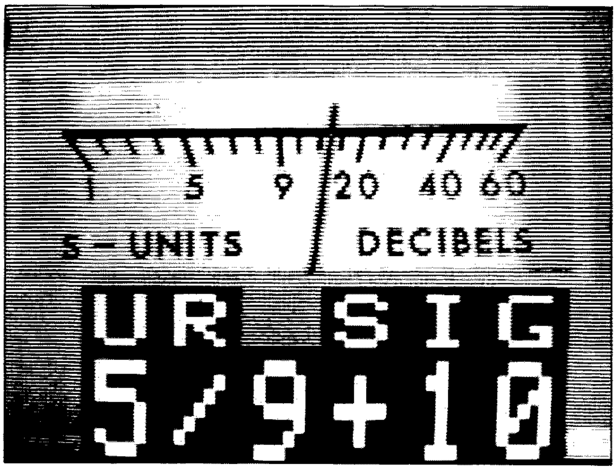

Photo B. Captured meter report on SSTV with station I3XQW.

ture paint down on my monitor screen was yet another ATV thrill. Seeing one paint down a few years later in color was even bigger excitement!

The neat pictures I received from ZS6BQT, ZS6BTD, ZS2AD, and 5N0DOG in Africa, as well as those from G3WW, KP4YD, LU4DGN, VK5RM, ZL1BLV, ZL2FR, OH2KM, JA1JRK, ON6DI, and many, many others, mean more to me than just another log-book entry or a QSL card.

The HF FAX contacts to Luxembourg; the SSTV reception letter from a shortwave viewer in Russia; the enjoyable multi-time slow-scan TV contacts with VE6PW, K6AEP, WB1ADZ, K4TGC, and others; the everyday FSTV QSOs and exchanges with the "local" crew—all these have played an important and very enjoyable part of my life. Ham radio and ATV are NOT just a hobby. They are an obsession.

Special Effects

Computers are used a lot on ATV, and the radio amateur who has not yet jumped into small personal computers is quickly becoming a relic of the past. Computers make great low-cost color bar and character graphics generators, and they will let you add special effects to operating modes and communicate over the airwaves just by pushing the right keys. They have opened up a whole new income potential for my low-profit business by helping me earn extra money in writing and modifying software programs.

The "photography" experience I have gained using cameras—learning how to get the best lighting out of the ATV shack or that hard-to-shoot color SSTV picture closeup—is invaluable. My many hours of VCR tape editing and programming assembly have led me to better appreciate things like TV special effects, commercials, documentaries, and what actually goes into making a movie.

My association with our local ATV group has taught me maturity in dealing with people, responsibility in doing things that I say I will accomplish, and everyday lessons in electronics—all because of ATV.

Before I move on to the next subject, I hope my thoughts about the "fun, education, and fellowship" that I have had on amateur television will demonstrate to YOU that getting on ATV is more than just sending pictures and making contacts. The mode itself will become a warm, new part of your life! It would be a shame to miss out on it.

ATV Info

The new 1987 ARRL *Handbook* has been out now for a few months. I mention it, at the risk of raising Wayne Green's blood pressure, because Bruce Brown WA9GVK/4 of the Washington DC Metrovision ATV group has once again done a superb job in writing and assembling chapters on visual communications. His presentation on FM TV was very thorough and should be commended. His time and work get fellow amateurs—many of whom he will never meet—interested in and on ATV. He is quite a positive credit to our hobby. Thanks, Bruce!

Don Miller W9NTP and Tom Hibben KB9MC are about ready to come out with their latest *SSTV Handbook* published by the League. Look for it!

N0HAV has a 20+ program disk package for you Commodore nuts. We have several similar versions for TRS-80C nuts. An SASE gets the information on both.

This year at Dayton, *Spec-Com* will be releasing the first ever USATVS North American ATV directory. It will list all USATVS members—the mainstream of fast- and slow-scan TV operators in the United States, Canada, and Mexico—as well as foreign members. We will try to include other active ATVers as well. Also to be presented is the latest ATV repeater roster, a 2-meter auxiliary audio channel map, a signal P chart, and a special section on organized FSTV groups and clubs around the country.

Spec-Com also offers an updated version of our famous CoCo-Radio TRS-80C Color Computer program. It is a collection of more than 30 programs, including FSTV, SSTV, RTTY, CW, FAX, OSCAR, TVRO, and other material, all of which needs no expensive interface requirements between your Radio Shack Color Computer and your HF receiver. Send an SASE, and we will give you the details.

Pass along the word about the *73/Spec-Com* WAS SSTV Contest—February 23 through March 1. Blow the dust off those P7 tubes, amigos, and let's hear some shrilling tones! ■

LOOKING WEST

Number 19 on your Feedback card

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

REPEATER OPERATION: U.S. VS. EUROPE

The other night, I sat down to write an article solicited by my friend Kris Partridge G8AUU. As you can note by his callsign, Kris is a resident of the United Kingdom, more properly, of Teddington, a London suburb. The story of how we met is an interesting one, and also an important one for this month's column.

It was in late 1981 when I received a note from another British amateur who was also destined to become a friend. Andrew Emmerson G8PHT had been given my name by our mutual friend Tom O'Hara W6ORG of PC Electronics. Andrew is an avid ATVer and also a collector of certain vintage broadcast television gear. He was specifically looking to find some old "Indian head" iconoscope tubes for his collection, and he had written to solicit my aid. Well, I had some leads on an iconoscope or two, none of which ever panned out. But in the process of writing to one another, we realized that we had a lot in common.

Since Andrew was a "G8" with no HF operating privileges, we were unable to hold on-air QSOs. Instead, we began to exchange "audio letters" recorded on tape cassette. In one of his cassettes during 1983, Andrew told me to expect a phone call from his friend Kris Partridge who was touring the United States and Canada. A few days later, I was awoken by a rather cheery-sounding voice over the phone that introduced itself with the callsign G8AUU.

It was election day 1983, and I knew that I would be working quite late that evening with our station's news department, which would be broadcasting live election updates "on the half hour" throughout the evening, continuing until the most important races had been decided. As the "department of one" responsible for their electronic news-gathering gear and on-air videotape playback facilities, I was required to stay on as well. I asked Kris to meet me for dinner and then hang around for a few hours, as I expected it to be a fairly "normal," albeit long, night's work.

I had only recently rebuilt the edit suites with the latest in BVU-800 U-matic VCRs from Sony Broadcast, and so I expected few problems with that gear. A few cameramen stopped by to get the heads of their portable field recorders cleaned, and one BVU-50 managed to snap a loading linkage belt. The part was in our stock, so the operator was quickly redispatched to political points unknown. There were the regular problems with some of the very old VCRs that we were using to record incoming feeds, but no real emergencies.

I was grateful to have Kris as a visitor, since nobody else working the swing shift had an interest in ham radio as well as in the broadcast industry. As it turned out, G8AUU was almost my counterpart for a television facility in the United Kingdom.

Kris and I talked about many things, and eventually the subject turned to FM and repeater operation. As we began exchanging ideas, I realized that it would be a formidable task to ever try to explain the way in which the amateurs of North America have developed their FM and repeater operations.

I learned from Kris that in most other parts of the world that permit FM and repeater operation, there is no such thing as "getting a repeater pair from a local frequency coordinator." In fact, the Radio Society of Great Britain technically holds the licenses to all repeaters operating in the United Kingdom. Can you imagine if the ARRL held the licenses to every repeater in the United States on direct order of the FCC? That's basically the way it is all over the world. Individuals and clubs own only the hardware, not the license!

For a group anywhere in England wanting a repeater, it is a long and arduous process to get a permit, even though the RSGB has a special section that's dedicated to only that purpose. The RSGB isn't what's slow; it's the British Department of Trade and Industry, their FCC. The same is true in many other western European nations as well. In most cases, getting a repeater on the air means working with and through the national amateur radio society.

And then there's the dichotomy that all European repeaters are "open systems" by their standards, but are "closed systems" by ours. This is because almost all western European nations require that you have a tone encoder in your radio to bring it up. This tone encoder is not the familiar CTCSS or PL™ that we use here; it's the older "tone-burst" system that was phased out of use in most of North America when 15-kHz split-splits came along in the early 70s. Some governments even dictate the tone frequency and the burst-length/duration. Our conversation proved that while two men can speak the same language, they do not always mean the same thing.

> ***"The Radio Society of Great Britain technically holds the licenses to all repeaters operating in the United Kingdom."***

Luckily for me, Kris was well aware of the vast number of repeaters in the United States and of the basics of our voluntary coordination process. As it turned out, he and Julian Baldwin G3UHK are the people who compile and produce *The International VHF FM Guide*. This is a softcover/hardbound 66-page book that covers all known repeater and FM activities worldwide. Its current edition, edition 6, contains lists of repeaters in 48 nations, an overview of operations in the United States and Canada (there was no room to print a list of almost 10,000 North American repeaters), and information on licensing in the nations covered. It would probably be very handy to any U.S. or Canadian ham planning a trip abroad.

While I was on the phone with Kris the other day, we happened onto the subject of the book, and I asked if he and Julian were planning an update. I should learn to keep my mouth shut, because within the winking of an eye, I found that I had committed myself to writing an explanation of North American FM and "relay" operation for their next revision. As this column goes to press, I am still at work on the project, and I can tell you that it's no easy chore.

Unfortunately, one cannot explain away the highly volatile and exceedingly political world of North American FM, repeaters, and other relay devices on a purely technical level. Unlike the remainder of the world, we "run our own shop," so to speak. So, how does one explain a "simplex autopatch" to a world of FM enthusiasts whose governments prevent them from having any type of phone patch or autopatch? How do you explain the difference between "closed" and "private" repeaters to a world where tone access is commonplace and all repeaters using it are "open"? How do you make those who have no concept of our standards understand that this difference is "political and operational" rather than "technical," especially when their system of repeater licensing precludes the politics that we have become accustomed to. How do I explain why in the United States in the upper 2 MHz of the two-meter band we use three divergent band plans, all of which have the blessing of our national society, the ARRL?

In most parts of the world, a nation's amateur radio society is looked upon in the same light as is that nation's agency that governs communications. For example, in the Netherlands, there are about 12,800 hams. Of these, over 12,000 are members of the Dutch national amateur radio society, the Veron. In the United States, there are almost 450,000 licensed hams, but only about 160,000 of them belong to the ARRL. But here in the United States, hams are not forced to go to the ARRL to get a channel pair for their repeater. Nor are they forced to go to the ARRL to take their amateur test, unless they desire to do so.

I still cannot help but wonder what other hams around the world will think when they read what I write about FM and repeaters in this part of the world. Will they understand all of the political chicanery? I doubt it. Will they think us fools? Who knows? Will they envy us our freedom of choice? That I think they maybe will.

One big change that is planned for the next edition of this guide is the inclusion of information on

packet operations around the world. If enough information can be garnered, Kris says that they will devote a separate section to it. Also needed is information on voice repeater operations from any nation, but particularly from Central and South America. The last edition carried listings only from Argentina, Brazil, Chile, and Mexico from that part of the world.

You probably want to know two things right now. Those of you planning a vacation to Europe must be wondering where you can get a copy of the current edition. Right? Well, that's easy. The cost is listed at £2.10 UK, which is equivalent to $3.25 in U.S. funds. I suggest that you write to Julian Baldwin, 41 Castle Drive, Maidenhead, Berks, SL6 6DB, England, to ascertain if this price is still correct. If you are outside of North America and want to provide information for the revised version of *The International VHF FM Guide*, send it either to Julian at the address above or to Kris at 6 Blagdon Walk, Teddington, TW11 9LN, England.

FUJI REVISITED

In November of last year, I told you about the mini-brouhaha that appeared to have developed between the Japanese Amateur Radio League and the folks at AMSAT. In case you missed that column, here's a brief synopsis.

When the JAS-1 Japanese amateur satellite was launched last August, the JARL renamed the bird Fuji after it was known to be in orbit and operating properly. However, at that time the AMSAT folks decided to call the bird OSCAR 12 and then Japan-OSCAR 12. Within a day, the JARL countered by sending out releases to most amateur publications saying that it was their satellite, and it was to be known as Fuji. And so it was that most of the ham press around the world began to do as the Japanese requested. Even AMSAT appeared to concede by changing their designation to Fuji-OSCAR 12.

Frankly, I thought that it would all end there, but it has not. A few days ago, ham publications received another telex from Japan, which was quite simple and to the point: "Please address the satellite only as Fuji." From this, I can only assume that the Japanese will insist forever and all time that the satellite be known as Fuji. Well, why not? After all, Fuji is their bird and they have the right to name it as they please. But, I did expect a compromise of some sort by now. AMSAT at least should be given an "E" for the effort.

Next month get ready for EATWG, and that's all for now from those of us who write the late shift from Los Angeles.■

FUN!

Number 16 on your Feedback card

John Edwards KI2U
PO Box 73
Middle Village NY 11379

HAM CLUBS

As far as ham clubs go, I've never been a joiner. Now don't get me wrong. For almost everybody, ham clubs are great. If run properly, they can entice kiddos into the hobby, provide a pleasant alternative to those stupefying TV football games, and possibly even promote the cause of world peace. But KI2U and ham clubs just don't mix, so don't even invite me to join one.

I'm not sure what the problem is. It doesn't have anything to do with the fact that I hold an Extra-class ticket. I also didn't fit in well with clubs when I held just a Tech, or even when I was unlicensed, for that matter. No, I guess I'm just not a coffee and doughnuts sort of guy.

This first became apparent to me one day back in the 70s when I attended a ham club meeting in my home town of New York City. This particular club (let's call it "The Tower of Apathy Radio Society") met at the old World's Fair site in a building that looked like a combination Minuteman silo/Egyptian tomb. The club officers and members were similarly schizophrenic.

I attended this particular meeting because advance word had it that the ARRL president was going to address his loyal minions. This was back in the days when I believed in Jimmy Carter, Z-80 computers, and the American Radio Relay League.

Anyway, on this fateful night, TARS self-destructed before its members' eyes. Boom! Pssfffft! Sort of like the way 160-meters acts when your neighbor puts a quarter into his vibrating bed.

TARS's undoing was the fault of one member (not me) who insisted that the club secretary read aloud the previous meeting's minutes. More clubs have destructed over this seemingly innocent request than all of history's botched Field Days and club picnics put together.

"The reaction of the ARRL to its newest affiliated club's newsletter was swift and not altogether pleasant."

The reading of the minutes worked like a catalyst. Quickly, all of the club's rivalries, hatreds, antagonisms, spite feuds, and petty quarrels spilled out onto the club floor and poured over the feet of Roland P. Fahrquar, the ARRL president. By the time ol' Rollie got to speak, it was 11:45 p.m. and most of the TARS members were already home in bed or nervously looking at their watches. I hadn't seen so many people stare at Mickey Mouse since the last time I visited Disneyland.

A friend told me not to worry, that the club usually behaved in this manner. I didn't believe him. I knew my presence was at fault. I have that sort of an effect on clubs.

A few years later, in an unrelated incident, I played a role in the formation of a new ham club. This insane idea was the brainchild of me, AF2M, KB2UF, AG2U, and a few other guys who used to waste perfectly good evenings rag-chewing on 15 meters.

Collectively, we decided that our organization would be the singularly most obnoxious club ever formed. We would hold no formal meetings, perform no public service chores, and never enter a Field Day competition. It would be lots of fun, however, and one thing we really did want to do was to publish a newsletter. Ham radio as it oughta be, one might say.

We called our club "The Uncle Floyd Radio Club," after a local kiddie show host, and set about getting ARRL affiliation and putting together *QRM*, our club's soon-to-be official newsletter. After all, what good is a ham club without ARRL affiliation and a newsletter? Why, not to have these two standard features would be like driving a car that lacked power seats or cruise control. Heaven forbid.

How shall I describe *QRM*? "Raunchy," "irreverent," and "bad taste" are terms that immediately come to mind. I honestly wish I could tell you what we put between the covers of that publication, but a sober mind and Wayne's desire not to have *73* soil the breakfast linen prevent me from doing so. Let me just say that it had a lot of satirical bite to it. It also wasn't too kind to the powers that rule amateur radio.

Before the ink was even dry on the first 100 copies, we set about deciding who would get complimentary subscriptions to our journal. Eventually, thanks to the *Callbook*, we sent a copy of *QRM* to every prominent ham we could think of, from Barry Goldwater to Donny Osmond to Roy Neal to Archie and Veronica. If we had known that Bernie Goetz and Pat Sherrill were hams, we would have sent them copies, too. We did, nevertheless, send copies to the president and general manager of the ARRL.

The reaction of the ARRL to its newest affiliated club's newsletter was swift and not altogether pleasant. Take it from me, the League is not always happy to see club newsletters, despite what they write in *QST*. Indeed, someone up at the League finked on us to our local division director, who was not entirely pleased to have the UFRC under his jurisdiction.

One night, the phone rang.

"Hello," I innocently said.

"Is this Edwards? President of something called 'The Uncle Floyd Radio Club'?" screamed the voice on the other end.

"Why, yes indeed," I replied.

"Well, I'm your ARRL division director," said the voice. "I just want to say that this *QRM* thing you're sending out is the single most disgusting piece of filth I've ever put my eyes on. You kids

ought to be ashamed of yourselves." (I was 22 at the time and recently graduated from college. But then, to the ARRL, I guess anyone not collecting social security is still a "kid.")

"Golly, sir. I guess we're just not working on the same wavelength," I said.

"Wavelength!" shouted the director, who was now on the verge of losing his voice. "I don't think you quite understand what I'm talking about. As an affiliated club, you're ARRL representatives. We can't have our clubs sending out pieces of stuff like this! (He didn't really say "stuff," but a euphemism for animal excrement.) Are you guys nuts?" (A point I had never considered.)

With that, the director told us we were an ex-ARRL-affiliated club. Sigh.

AF2M told me a few days later that he also received a call from the director. According to Bob, who was *QRM*'s editor, the tone of the conversation was pretty much the same as the one I had experienced. Unfortunately, Bob, during the course of the chat, managed to describe a trip the director took at League expense to Switzerland as a "paid vacation." This was an unfortunate choice of words that resulted in a string of obscenities pouring from Bob's phone, the like of which had never even made their way into *QRM*.

So, as I reflect on this little story, I realize I may be the only ham club president in amateur radio history ever to have had his club officially booted out of the ARRL. What a dubious honor: to be metaphorically thrown out of the gates of 225 Main Street and made to eat the bitter dust of Newington, Connecticut.

Don't believe me? Then check the *Callbook* for WA2DCS.

You know, I'm just not a joiner.■

RTTY LOOP

Number 26 on your Feedback card

Marc I. Leavey, M.D. WA3AJR
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Okay, everybody—HAPPY NEW YEAR! "What's that? He said, 'Happy New Year'?" "He must be daft—he started off last month's column that way." "Doesn't he know that this is February?"

Well, yes, I do know that this is February, but the wish remains. Why? Well, let that be my challenge for the month. But I will tell you this—the wish is sincere and appropriate. And, a roll of Teletype® paper tape to the first of you who tells me *why* the greetings are in order. Want a hint? Consider the prize.

Software Solution

Now, on to the matters at hand. Last month I presented one man's solution to the "carriage return delay" problem with a Teletype teleprinter connected to a computer. His was a hardware solution. I promised you an answer in software. Fig. 1 is a flowchart of the proposed solution.

Following along, you will notice that a diversion is placed in the character output routine, via a convenient RAM hook provided by the author of CoCo Basic. Once you are sure that the device selected is the printer (DEVNUM = −2 or $FE), you see if the character being sent is a carriage return. If it is, a flag is set to remember this fact. If not, and the flag is not already set, the character is sent out the normal way. If the flag is set, however, the program loops to waste some time, while the carriage returns. By the way, if you wanted to, you could insert a few lines of code here to send out a line-feed character, for those printers that require a separate line feed.

Program listing 1 is an assembly-language listing of the program alluded to in the flowchart. It is written in position-independent code so users of 16K, 32K, and 64K CoCos should have no problems installing it. For all I know, it might even run on a CoCo 3.

"Kantronics' UTU will allow about any computer capable of driving a modem to interface with an amateur transceiver."

COMMPRO

A few months ago, I noted a software glut for the Z-80 TRS-80 computers. As if by magic (fat chance), guess what I received in the mail? Lew McIntyre KB6IC of Omaha, Nebraska, tells me of his program, "COMMPRO," for the TRS-80 Model 4/4P/4D computers.

Lew's program. . . wait, let me tell you what Lew says about COMMPRO: "WAIT! Here is the program you have been waiting for! Written in Alcor Pascal specifically for the Model 4, the program is fast and powerful. It provides you with keyboard procedures that are customized for real-time data communications."

Some of the features this program includes are a split-screen display (featuring sixteen 80-character lines for receive and five 80-character lines for transmit) and two status lines (one dedicated for a Kantronics UTU and one maintaining system status information). Ten buffers are recallable with one key each; each buffer can hold up to 255 characters and can be loaded from or saved to disk.

Incoming traffic can be saved directly to disk, and file transmissions can be interrupted so that you can put in an identifier or ask for a quick confirmation of receipt—or just say, "Hi."

Do I have to include the obvious? Sure, COMMPRO operates on Murray (Baudot), ASCII, CW, even AMTOR, and has enough bells and whistles for a one-horse sleigh. (Remember that I write this a few months before you read it!)

Anyway, the whole thing costs but $30, and I'm sure Lew would be glad to answer any more questions you might have. Drop him a line at 3711 Gayle Avenue, Omaha NE 68123, and don't forget to tell him you read about COMMPRO in RTTY Loop.

Kantronics UTU

I mentioned the Kantronics UTU above, and did not say much more about it than the name. Well, a letter from Travis Brann, the Technical Services Manager at Kantronics, arrived the other day with some information that may be of more than a little interest to many of you. One of the common questions lately has been of the "How do I get my _____ computer onto RTTY?" variety. Travis points out that their—and I might presume others'—line of "smart" terminals will allow about any computer capable of driving a modem to interface with an amateur transceiver.

Looking at Kantronics' Universal Terminal Unit, also known as the UTU, one can get an appreciation for just what a "smart" terminal is. The classic terminal unit acts as a translator between the

```
Start
  |
  |
  Is    No
Device ------------------------+
 #-2                           |
  |                            |
  |                            |
  Is    Yes                    |
CRFLAG ------ DELAY            |
 Set?           |              |
  |           Clear            |
  |           CRFLAG ----------|
  Is    No                     |
 Char -------------------------|
  CR?                          |
  |                            |
 Set   ------------------------|
CRFLAG                         |
                               |
                               |
                              Exit
```

Fig. 1. Program flowchart.

```
                     ØØ1ØØ * PROGRAM TO ADD A DELAY AFTER
                     ØØ11Ø * CARRIAGE RETURNS TO ALLOW A
                     ØØ12Ø * MECHANICAL TYPE BASKET TO
                     ØØ13Ø * RETURN
                     ØØ14Ø ******** RTTY LOOP  FEB 1987 ********
                     ØØ15Ø ** (C) 1986   MARC I. LEAVEY, M.D. **
         Ø167        ØØ16Ø HOOK      EQU  $167
                     ØØ17Ø *
ØØØØ BE Ø168         ØØ18Ø START     LDX  HOOK+1
ØØØ3 AF 8D  ØØ35     ØØ19Ø           STX  EXIT+1,PCR
ØØØ7 B6 Ø167         ØØ2ØØ           LDA  HOOK
ØØØA A7 8D  ØØ2D     ØØ21Ø           STA  EXIT,PCR
ØØØE 3Ø 8D  ØØØB     ØØ22Ø           LEAX OUTDLY,PCR
ØØ12 BF Ø168         ØØ23Ø           STX  HOOK+1
ØØ15 86 7E           ØØ24Ø           LDA  #$7E
ØØ17 A7 8D  Ø14C     ØØ25Ø           STA  HOOK,PCR
ØØ1B 39              ØØ26Ø           RTS
                     ØØ27Ø *
ØØ1C ØØ              ØØ28Ø CRFLAG    FCB  Ø
ØØ1D 81 FE           ØØ29Ø OUTDLY    CMPA #$FE
ØØ1F 26 1A           ØØ3ØØ           BNE  EXIT
ØØ21 ØD 1C           ØØ31Ø           TST  CRFLAG
ØØ23 26 Ø8           ØØ32Ø           BNE  DELAY
ØØ25 81 ØD           ØØ33Ø           CMPA #$ØD
ØØ27 26 12           ØØ34Ø           BNE  EXIT
ØØ29 ØC 1C           ØØ35Ø SETDLY    INC  CRFLAG
ØØ2B 2Ø ØE           ØØ36Ø           BRA  EXIT
ØØ2D 34 1Ø           ØØ37Ø DELAY     PSHS X
ØØ2F 8E FFFF         ØØ38Ø           LDX  #$FFFF
                     ØØ39Ø * ADJUST THIS CONSTANT AS NEEDED
ØØ32 3Ø 1F           ØØ4ØØ DLOOP     LEAX -1,X
ØØ34 8C ØØØØ         ØØ41Ø           CMPX #$Ø
ØØ37 26 F9           ØØ42Ø           BNE  DLOOP
ØØ39 35 1Ø           ØØ43Ø           PULS X
                     ØØ44Ø *
ØØ3B ØØ              ØØ45Ø EXIT      FCB  Ø
ØØ3C ØØØØ            ØØ46Ø           FDB  Ø
                     ØØ47Ø *
     ØØØØ            ØØ48Ø           END  START
```

Program listing 1. Adds a delay after a carriage return to allow a mechanical-type basket to return.

signal, normally audio from a receiver or to a transmitter, and a local loop, either a current loop for a conventional teleprinter or RS-232 levels for a computer functioning in a terminal mode. That's it, maybe some kind of selective calling, but there are no other "smarts" on board.

These new smart terminal units change all that. The UTU, for example, has its own internal microcomputer, which allows any personal computer running a terminal program to interface on either RS-232 or TTL levels, and function as a full-featured RTTY machine. Accessing the UTU is through an internally generated menu, and simple keyboard commands control all operations.

The unit supports transmission and reception of CW from six to 99 words per minute; Murray RTTY on 60, 67, 75, 100, and 132 words per minute; ASCII at 110, 150, 200, and 300 baud; and AMTOR modes A, B, and L. All RTTY shifts are received, although transmission is only supported at 170-Hz shift. While an internal LED bargraph tuning indicator is available, conventional oscilloscope outputs are provided for those who like to watch flickering green ovals.

Check out some of the Kantronics line at your local dealer, or drop them a note directly at 1202 East 23rd Street, Lawrence KS 66046, and mention my name, OK? By the way, next month I'll tell you how to hook up a UTU or other "smarty" to quite a variety of personal computers.

One ham who has done just that is Robert L. Bobst KØSGE of Earlham, Iowa. Robert says that he is a newcomer to computers and RTTY, and has enjoyed much of what has been covered in this column. Anyway, he is using a Kantronics UTU, driven by a Tandy Color Computer using their Videotex terminal package. His ham setup is a Kenwood TS-180 with CW filters.

He finds that the UTU tunes very well with its visual LED bargraph display and, with the FSK filters in the Kenwood, it is extremely sharp. The drawback is that the FSK filters are on the wrong sideband on forty and eighty meters.

Also, he says the setup is "like a straight key, it keeps you honest." Robert says that with no hard copy facility and no way to review the text before it is sent, communications are more "live," and typing mistakes and small hesitations impart a lot of information about yourself and your contact.

I might note that this is more a function of the terminal program you are running than the UTU. Even a public domain terminal program for the CoCo such as MickeyTerm (available on both Delphi and CompuServe in the CoCo SIGs), which supports keystroke buffers, may help in facilitating some of your "live" problems. Good luck, and thanks for writing.

Sundry Items

Welcome to new subscriber Bill Porter KD9MR of Zion, Illinois. Hope you enjoy the wide variety of material here in *73*, Bill, and take the time to fill in that "bingo card." Use it to get valuable information from our advertisers, and to give valuable information to us, about what you like within these pages.

I don't know how "fabled" it is, Jim Zimmerman KG6VI of Lancaster, California, but I am happy to send you the list of reprints of old RTTY Loops. There is material in there for novices and old hands alike. Happy to mail a list to any of you; just send a self-addressed, stamped envelope to me at the above address, and be a bit patient. I do drag my feet a tad now and then.

Speaking of "fabled" items, greetings to Steve Rosman KA2YRA of Fresh Meadows, New York. Steve is using an OSI—that's Ohio Scientific for you newcomers—computer. On RTTY, Steve? As I recall, OSI used to use several CPUs in their computers. Wonder which one you have.

Cordial Hi-Ho-RTTY-o greetings to some more of our friends: C. D. Campbell, Jr. AA4UM of Madison Heights, Virginia; Jim New WA4DHD of Griffin, Georgia; Wayne King N2WK of Rochester, New York; and all the others who have dropped along this line or that over the last few months.

The information flow into this station continues at a record pace. Feel free, no—do more than that—I encourage you to drop me your questions and comments on RTTY, digital communications, and computers. Send written comments to me at the address at the head of this column, or electronic ones to me via CompuServe (ppn 75036,2501) or Delphi mail (username MARWA3AJR). I try to answer all questions received, either personally or in the column. I don't promise speedy responses, but I do respond.

I was not kidding about the little contest up front. The first correct response received, as determined by postmark on Postal Service letters or electronic dating on E-mail, to the "Happy New Year" question will win the responder a genuine roll of RTTY punch paper tape—unpunched, of course. Now, this should be interesting.

I've promised you a few things for next month. I'll keep those promises and add even more in next month's RTTY Loop.■

HAMSATS

Number 17 on your Feedback card

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AMSAT GENERAL MEETING/ SPACE SYMPOSIUM 1986

Take a cool November weekend in Dallas, add about 150 dedicated satellite enthusiasts, mix in some of the world's foremost ham satellite designers and supporters, and you end up with the 1986 AMSAT NA (Radio Amateur Satellite Corporation of North America) General Meeting and Fourth Annual Space Symposium. This annual meeting gives us a status report on AMSAT and helps shape our direction for the future.

Presently, our most exciting satellite activity centers on the experiments with the digital transponder (mode JD) on board Fuji-OSCAR 12. At the Space Symposium, JAMSAT (the Japanese affiliate of AMSAT NA) president Harry Yoneda JA1ANG discussed the challenges faced by those responsible for the success of FO-12.

Former AMSAT NA president Dr. Tom Clark W3IWI (Photo B) demonstrated a prototype modem to allow a standard packet TNC access to the Manchester-encoded PSK used for mode JD on the satellite. The version Tom demonstrated included circuitry from the JARL/JAMSAT PSK demodulator described in the August, 1986, issue of *QEX* and modulators he developed in conjunction with TAPR (Photo C). A full kit or semi-kit of parts should be available from TAPR soon if interest is sufficient.

A British version by James Miller G3RUH has been available for several months. Although the circuit is somewhat simpler than the JAMSAT/TAPR version, it has been tested and is rather easy to build. It is presently in stock at Radiokit, Box 973, Pelham NH 03076; (603)-635-2235. The complete kit is available for $99 (not including cabinet; requires power supply). Just the PC board and instructions cost $24.99. A cabinet is available for $12. (There is a flat $4 shipping and handling charge—non-U.S. orders please inquire.)

I have found the G3RUH version to be quite functional. Note the FO-12 PSK telemetry in Fig. 1. This is just a small portion of the tens of thousands of bytes of data received with the G3RUH board on a single mode-JD pass. The PSK signals from FO-12 are quite strong on a beam antenna with a simple preamplifier.

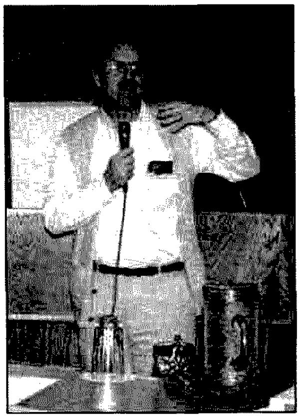

Photo A. Dr. Tony England WØORE talks about future ham-in-space activities at the AMSAT Space Symposium.

Photo B. Former AMSAT president Dr. Tom Clark W3IWI explains phase-shift keying with the Fuji-OSCAR 12 digital mode.

```
8J1JAS>BEACON:JAS-1 RA 86/11/16 02:27:50
002 676 647 647 701 877 888 862 003 273
648 002 548 591 582 576 578 580 689 002
721 715 723 717 767 678 927 000 000 000
010 111 100 000 100 000 001 000 000 000

8J1JAS>BEACON:JAS-1 M0 86/11/16 02:27:52
Telemetry Information:
#00(1st):solar cell current = 1.91*(N-4)   mA
#01(2nd):battery current    = 3.81*(N-528)mA
#02(3rd):battery voltage    = N/1000*21.0  v

8J1JAS>BEACON:JAS-1 M1 86/11/16 02:27:53
86/11/15 17:10:00 JTD ON
yy/mm/dd hh:mm:ss JTD OFF
yy/mm/dd hh:mm:ss JTD ON
yy/mm/dd hh:mm:ss JTD OFF
yy/mm/dd hh:mm:ss JTD ON
yy/mm/dd hh:mm:ss JTD OFF
yy/mm/dd hh:mm:ss JTD ON
yy/mm/dd hh:mm:ss JTD OFF
```

Fig. 1. Fuji-OSCAR 12 telemetry and information received from the digital beacon. AX.25 protocol with PSK modulation.

Any differences in performance between the TAPR and G3RUH units will likely be overshadowed by the signal levels present. When the "mailbox" software is loaded into the FO-12 computer, activity will be much more exciting than just copying telemetry.

Interfacing an FO-12 modem to a typical amateur radio satellite station is not easy. Note all of the interconnections shown in Fig. 2. In addition to microphone, PTT, and speaker connections, digital control of the receiver is necessary to counter Doppler shift during the satellite pass. Wiring modifications are necessary inside your TNC. The end result is quite satisfying, but it is a lot of trouble to make the custom inclusion of the new modem.

PSK has a 10–20-dB advantage over the typical Bell 202 AFSK FM in common use on VHF today. Although PSK is our only way to receive the digital signals from FO-12, we may also see this form of signal modulation become quite common for terrestrial use as the advantages become more apparent.

OSCAR 10

Fuji-OSCAR 12 isn't the only hamsat in the sky. Even with its declining memory, AMSAT-OSCAR 10 has been released for "guarded" use whenever the transponder is turned on. Since there is virtually no control over spacecraft attitude (its orientation in space), signal levels and operating schedules are impossible to guess. AMSAT vice president for operations Ralph Wallio WØRPK (Photo D) presented a failure analysis of AO-10 at the Space Symposium. The most significant fault noted was the radiation damage sustained by the Integrated Housekeeping Unit (IHU) memory.

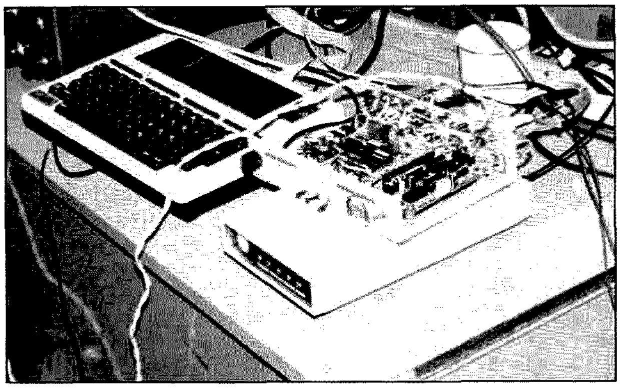

Photo C. The JAMSAT/TAPR FO-12 modem on top of a TAPR TNC.

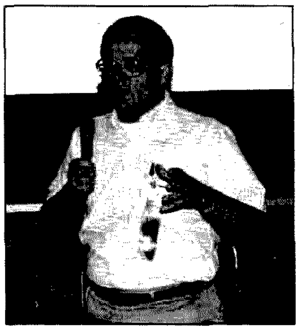

Photo D. AMSAT vice-president for operations Ralph Wallio WØRPK presents the OSCAR 10 status and engineering report.

Dr. Martin Sweeting G3YJO of the University of Surrey discussed the continued operation of the UoSAT series of amateur spacecraft. UoSAT-OSCAR 9 and UoSAT-OSCAR 11 continue to send telemetry in many modes including voice, CW, and ASCII to monitoring stations the world over. Predictions on the life-expectancy of the remaining RS satellites were impossible, but new replacements may be just over the horizon.

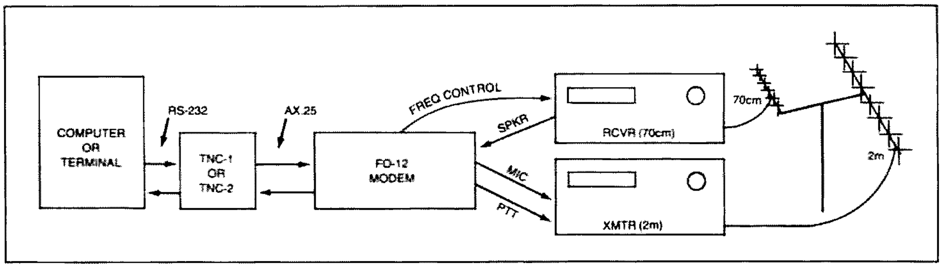

Fig. 2. Block diagram of the equipment needed for FO-12 digital mode.

The Future

Looking to the future was an AMSAT activity shared by all participants at the Dallas meeting. What frequencies will the new RS birds use? What experiments will be on board the next UoSAT? What's the status of the French Arsenne project? What can we expect from the digital experiment on Phase 3C, OSCAR 10's replacement? What will the new modes be like? Two very far-reaching projects on the active list for the future include the Packet Technology Satellite Experiment and studies on the possibilities for Phase 4 (geosynchronous amateur radio satellites).

The PTSE project is based in the Houston area and may include a series of small low-earth-orbit (LEO) satellites demonstrating packet "digis" with "mailboxes" in space. The space hardware will allow uncomplicated ground stations using a standard TNC and FM two-meter rig with a simple "omni" antenna and moderate power. The user will be able to "connect," and then retrieve and leave messages on the system. Since the first stage of the project depends on the use of the space shuttle, it will be a long-term undertaking.

Projecting even further is the Phase 4 project. The attendees at the Space Symposium showed their intense interest for geosynchronous hamsats by packing the meeting room for AMSAT vice president for engineering Jan King W3GEY's technical review of the topic. This was at 7:30 a.m. on Sunday. In addition to all of the fantastic possibilities of a satellite suspended over one area of the earth, Jan pointed out the enormous cost in time and money needed to pursue the project.

Some of the goals of Phase 4 include spectrum occupancy of the VHF, UHF, and microwave bands and public benefit with education, emergency preparedness, and international exchange. Involvement from other amateur-radio and space-community groups will be necessary due to the large scope of the project. Phase 4 will not include simple satellites. They will be very sophisticated, technology-bending experiments in space using many untried concepts for efficient and powerful amateur communications. AMSAT NA has approved funding for the feasibility studies.

Satellite Tracking

Enough of these crystal-ball sessions. There are other projects closer to the present, but before you can pursue ANY satellite effectively, you will need to know where the spacecraft are and where to listen. You need tracking information.

Tracking can be a simple task with the help of a number of aids ranging from inexpensive mechanical plotting devices to completely automated, computer-driven rotator systems. Each method differs in cost, function, and complexity. The correct one for you will depend as much on your preferences and needs as on the status of your checking account.

Manual Tracking

For many years, manual tracking aids have been the primary tools used by satellite chasers to keep tabs on OSCAR and RS satellites. Those aids usually consist of a polar projection map and some clear overlays imprinted with signal-acquisition circles and satellite ground tracks.

An acquisition circle shows the maximum range of the satellite and thus its accessibility to a ground station. The ground track shows the path of the satellite projected over the earth's surface. Together, they provide a graphic means of finding usable passes and give information for accurately orienting antennas toward the passing satellite.

With the help of an orbital calendar (such as those available from Project OSCAR, PO Box 1136, Los Altos CA 94022) the times and longitudes of ascending equatorial crossings can be determined. Used in conjunction with the manual tracking aid, the information quickly gives you passes that will be in range of your station and the times that a satellite will be above your horizon.

Manual tracking works quite well for low-orbiting satellites, such as FO-12, and permits you to visualize the path of the satellite as it travels around the earth. With some modifications, those aids can be adapted for use with OSCAR 10 and other satellites with high elliptical orbits, but the chore can be difficult. Because the orbital altitude is no longer constant, and due to other orbital characteristics, the ground track is continually changing. Thus, a new overlay is required every six weeks or so.

Manual tracking aids can be built or purchased. The ARRL sells its OSCARLOCATOR package, and ZRO Technical Devices (PO Box 11, Endicott NY 13760) markets a device called the Satellipse. Instructions on how to put together and use a manual tracking system can be found in *The Satellite Experimenter's Handbook* by Martin R. Davidoff K2UBC (available for $10 from AMSAT, PO Box 27, Washington DC 20044).

The cost of a manual tracking aid is minimal and preparing it for a pass requires little time. However, some effort is required to keep up with the latest equator-crossing information.

Computer Tracking

The home computer has become an increasingly popular tool for keeping track of amateur satellites. With a good tracking program and printer, one can make accurate orbital predictions and generate a detailed plot for weeks or even months into the future.

Excellent programs are available for the C-64, IBM PC and clones, and many others. Program complexity varies from one machine to another. Some programs provide only a tabular listing of times and antenna pointing angles, while others can keep up with many satellites, constantly updating their positions on a map of the earth. There are several sources of tracking software. A good place to start is the AMSAT Software Exchange at the address noted above.

The ultimate tracking system is one that will automatically find a chosen satellite and then aim the antennas for you. Such a system uses special interface circuitry to tie the computer to the antenna rotator. Of course, specialized software is also needed to determine antenna orientation and to keep the antenna aimed at the predicted satellite position. If you'd like to go the home-brew route, there was an article in *Orbit* Magazine, issue 11, for the Apple computer. The September, 1986, issue of *QST* has an article about an RS-232 connected antenna positioner.

Spectrum West of Seattle, Washington, markets an interface for the VIC-20, Timex 1000, and C-64 in conjunction with potentiometer rotators such as the Kenpro KR400/500 series. Encomm of Dallas, Texas, recently released an interface cartridge that plugs into the game port of the C-64 or C-128. It is designed for the Kenpro 5400A or 5600A rotators and works with the C-64 Maptrak program sold by AMSAT. This unit will not work with the older control boxes for the 5400 and 5600. The older units do not have thermal cut-offs which are required for use with the interface. Encomm promises an IBM version soon that will use the serial port. It will also work with the PCjr.

If you already own a computer or have access to one, your best bet is to get a satellite tracking program. If computers are not for you, a manual tracking device will keep you pointed in the right direction. Remember that satellite tracking is not difficult to learn. It will help you make contacts via the highest repeaters around. ■

WEATHERSAT

Number 28 on your Feedback card

Dr. Ralph E. Taggart WB8DQT
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Mason MI 48854

SATELLITE DISPLAY SYSTEMS

Feedback! Although this is already the fifth column to appear in print, only a single one has actually hit the stands as I sit down to write this one! Already, however, I am beginning to get some initial feedback, much of which I hope to incorporate as we go along.

One persistent theme in the early letters concerns the business of actually displaying the satellite images—usually expressed as a request for recommendations as to the "best" display system for the satellite station. There are many approaches to satellite image display, and none of them is "best" from all points of view.

Since this is bound to be a recurring theme, I will devote this column to a basic description of the various approaches. Detailed descriptions of projects of each type can be found in the *Weather Satellite Handbook* and other sources. This time around, I will confine the discussion to the basic approaches, along with the advantages and disadvantages as they occur to me.

As far as the approaches are concerned, there are three primary ones, some with functional subdivisions. They include analog CRT displays, facsimile recorders, and digital scan converters. These three quite different approaches to image display need not be considered as completely separate, however. With careful choice in the selection of circuits used, many components from one project can be used in another.

This "modular" approach to design forms the basis for the projects described in the latest edition of the *WSH*, facilitating the growth in sophistication of your station with time. In fact, it is entirely possible to have one central console that will drive all three forms of display with no duplication of common circuit modules if you want to go that route.

Analog CRT Monitors

CRT monitor circuits are very appealing to new satellite experimenters because they are both simple and versatile, providing many a newcomer to the hobby with his or her first views of the Earth from space.

A basic analog CRT monitor has very few circuit elements. You need video circuits to convert subcarrier amplitude to brightness variations in the CRT trace, a timebase to provide either 4-Hz or 2-Hz trigger pulses for the horizontal line sweep, some horizontal deflection circuits to scan the raster from one side of the screen to another during the interval between trigger pulses, and a vertical deflection circuit to scan the raster from top to bottom in either 400 seconds (WEFAX, 240-line METEOR, and visible or IR NOAA APT) or 800 seconds (simultaneous visible and IR NOAA APT or 120-line METEOR).

Phasing circuits and control of vertical sweep are usually manual, resulting in an extremely simple design. Since a single timebase can generate both 4- and 2-Hz signals quite easily and since multiple sweep rates are a simple matter of switches and adjustable pots, the CRT monitor is inherently a multimode device, easily constructed or modified for display of any direct-readout satellite format.

Essentially a CRT monitor "paints" the incoming satellite image on the screen in real time. Given the range of available phosphor types for the CRT, you cannot "see" the entire image at any time. This means that the CRT display must be recorded using a time-exposure photograph, usually taken in a darkened room or with a light-tight hood. Physically, the monitor approach can range from an external "black box" driving an oscilloscope or modified TV or computer monitor chassis for display, up through dedicated monitors with everything built into a single cabinet.

With a small CRT (five inches or less), it may not be possible to focus the scanning raster sharply enough to achieve the full 800-line resolution expected in, say, the WEFAX format, although the pictures from a small-screen display can be entirely satisfactory. Full resolution can usually be obtained with screen sizes of eight inches and larger.

Advantages include simplicity, low cost, and inherent multimode capability. Most of the disadvantages involve the need to photograph the image. Instant pictures will require the use of Polaroid™ film and cameras, and this can run into some expense if you take a lot of pictures, not to mention the fixed (and relatively small size) format of the resulting photograph.

The use of 35mm cameras and film reduces costs considerably and permits any desired final image size (with enlargements from the original negatives). This approach works well if you are already into photography, but some work and delay are always to be expected before you see your pictures.

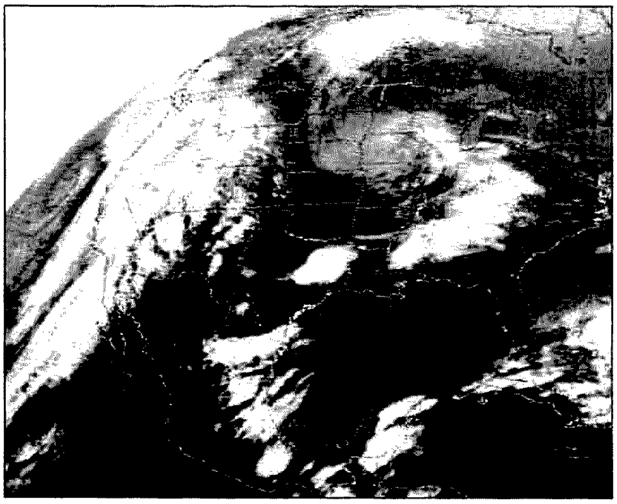

Photo A. A photographic FAX print of an old NW WEFAX IR quad, printed on a photographic version of the FAX recorder described in the Weather Satellite Handbook.

Facsimile Recorders

A FAX recorder is a combination of electronics and mechanics that, in one way or another, ends up printing an image directly onto a piece of recording paper. Recording media may be various types of photographic material, where the image is "painted" using a modulated light source, or the medium may be an electrostatic or electrolytic paper in which the image is created by applying a modulated voltage to the stylus, creating mechanical or chemical changes in the paper that produce the image. Photographic media always require some sort of processing to view the final image, while electrostatic or electrolytic media usually produce the image directly.

FAX recorders can also be classified in terms of how they handle the paper. In drum-type recorders, the medium is loaded a single sheet at a time, and each picture requires loading of a new piece of media material. Continuous-feed recorders feed the medium from a roll and can typically print a large number of pictures without reloading. Before looking in more detail at media and design, some general observations are in order.

All FAX recorders achieve the proper speed for the equivalent of horizontal and vertical scanning by using synchronous or stepper motors in conjunction with various kinds of mechanical drives. This means that any home-built FAX project involves both mechanics and electronics (for signal processing, timebases, and motor drives).

To print a decent FAX picture, all of the mechanical elements have to function with a high degree of precision; this makes the construction of a FAX recorder a more demanding exercise for most people than a comparable CRT display. In all fairness, it can also be fun, if occasionally frustrating, if you like to fiddle with "gadgets."

Media

The common photographic media fall into three categories—printing on photographic film, direct printing on standard photographic enlarging paper, and direct printing on heat-processed photographic paper. In the case of film, the system is designed to produce a photographic negative from which contact prints or enlargements can be made.

The primary advantage of film is

that extremely sensitive film can be employed, permitting the use of a low-level light source, such as a modulated LED. The disadvantages of film include the high cost of cut-sheet film and its limited availability, and the inconvenience and time involved in wet-processing both film *and* prints.

Direct printing on standard enlarging paper is the most common approach to a photographic FAX system. The electronics must be designed to cause a positive image to be printed on the paper, and only the paper need be processed. Images can be of exceptionally high quality and, like all properly designed FAX systems, this one will always give you a full-resolution image. The paper is quite a bit less expensive than an equivalent size of cut-sheet film, and processing is less demanding. You do have to maintain a minimal darkroom, preferably with the recorder located inside it, but such a system can produce pictures of the highest possible quality to justify your added efforts.

Heat-processed photographic media are produced by companies such as 3M and are used in recorders like the Harris Laserfax™. They handle like conventional photographic paper up through the exposure, but differ in that the processing involves running the paper through a set of heated rollers to bring out the image.

The images can have all of the inherent quality of a standard photographic FAX system and yet avoid the disadvantages of "wet" darkroom processing. Despite this advantage, I do not like these papers—even after extensive experimentation.

First, the images will darken with extended exposure to normal room lighting. They will retain their original dynamic range only if stored out of the light. Second, once exposed to room light for however short a period, any further exposure of the paper to high temperatures will completely blacken the image. I discovered this one day with an astonished look at some prime prints that I left in a briefcase in a car on an August day!

All of the photographic paper systems share a common problem related to the fact that the papers are far less sensitive to light than film. This requires a fairly intense modulated light source for exposure, usually a glow-discharge crater tube of some type, operated from a high voltage supply (300–400 V), used in conjunction with a lens system.

Date	01 February 1987	
Spacecraft	NOAA-9	NOAA-10
Orbit Number	11011	1939
Eq. Crossing Time (UTC)	0001.33	0041.33
Longitude Asc. Node (Deg. W.)	135.63	77.46
Nodal Period (Min.)	102.0851	101.2979
Frequency (MHz)	137.62	137.50

These orbital parameters are projected two months in advance due to deadline considerations. Accumulated errors due to uncompensated orbital decay and other anomalies result in expectation of errors up to two minutes and possibly as many degrees in terms of the crossing data and possible small changes in the indicated period. Users requiring precision tracking data should rely on more current sources.

Table 1. TIROS/NOAA orbital predict data.

The crater tubes are becoming harder to obtain, and costs are definitely on the rise. Fiber-optics and solid-state lasers represent one possibility for the next generation of alternatives for modulated light sources.

Electrostatic and electrolytic media have the advantage of producing an immediate image without additional processing. Electrostatic papers work by applying a high voltage to the paper, burning away varying amounts of a white surface layer to expose an underlying black base layer.

Of the various electrical papers, electrostatic media have the potential to produce a fine grayscale (in true black and white) that can approach, although never truly equal, photographic paper in quality. The papers are dry and require no special handling or storage, the image can be printed in normal light, and the images are absolutely permanent short of conditions that would discolor any normal paper products. The principal disadvantage of such papers is that they produce a small amount of smoke during the printing process.

Electrolytic papers work by means of the applied stylus current, inducing a proportional chemical reaction in the paper that causes it to darken at the point of applied current. The quality of the resulting grayscale depends upon the specific type of paper, and most result in a sepia-and-white image instead of a strictly black-and-white rendition.

These papers must be moist in order to function, a factor in both storage and the design of the recorder so that the roll of paper (most are used in continuous-feed machines) stays moist until all the material has been used.

Image permanence varies greatly with paper type. The best papers will discolor only slightly with time, but many grades will darken or fade to the point where the images are eventually useless.

Electrolytic systems excel in the continuous-feed mode, where large numbers of images must be produced and analyzed but where archival qualities are not at a premium. If the number of pictures required is smaller, electrostatic recorders can provide a noticeable increment in quality and permanence with a high level of convenience. Photographic systems can provide the apex of quality, but are usually best suited to a low image volume given the additional processing requirements.

FAX recorders, whether home-constructed or modified from commercial surplus, offer full-resolution capability with image quality dependent on the specific medium.

The major operational disadvantages of FAX systems are twofold. First, the mechanical nature of the system confines you to a single size format and, since motors and gears control "scanning" rates, it is more difficult to achieve multimode capability with a FAX recorder than is the case with a CRT or scan converter system. Second, a FAX machine has to be fed paper, and the budget for paper and processing chemicals (if needed) can become burdensome if you want to handle large numbers of pictures, such as the daily image output of a spacecraft like GOES Central!

Digital Scan Conversion

Digital scan converters accomplish the seeming miracle of taking a slowly arriving satellite picture and converting it for display on a standard TV monitor. In principle, all such systems operate by converting the incoming video variations to numerical values that are stored in solid-state memory as they arrive. While the information must arrive slowly in the normal satellite video format, the output of the memory can be cycled at extremely fast speeds to create a non-fading image on a TV monitor, which will persist as long as power is applied to the system.

Scan converters have two primary configurations: hard-wired, in which all of the image sampling and output functions are wired into the unit, or the more desirable microprocessor-controlled mode, where image sampling and display are under software control. The latter includes scan converters controlled by a variety of small microcomputers. The *WSH* delves extensively into both the theory and construction of scan converters, and I will not repeat much of that basic information here.

Suffice it to say that there are two primary constraints on the quality (resolution and grayscale capability) of a scan converter. The first is the size of the memory available to store the image data. This was a serious constraint in the days when microcomputers were limited to 64K of available RAM. But with various approaches to extending memory capacity, together with a steady drop in the price of memory, it is now practical to store an entire image at essentially full-resolution with so many grayscale steps (255) that you cannot perceive the digital nature of the image.

The real bottleneck is the TV display. Depending on the set or monitor, spatial resolving capabilities (in convenient digital terms) will range from a low of 256 pixels/line with 256 lines in a non-interlaced display to a maximum of about 512 pixels/line with 512 lines for a top-line display with fully functional interlace. Sixteen grayscale steps/pixel usually provides acceptable tonal resolution, and if you go to 32 or 64 steps/pixel, the results are indistinguishable from analog on the best standard monitors. With appropriate sampling, either from the incoming picture or from

a larger image data set in memory, very fine full-frame images can be displayed even though they lack the full resolution of the image format.

When one considers that a scan converter can display all of the products of a given satellite automatically, without using a single sheet of paper, the appeal of these devices is understandable! The *WSH* describes an extremely simple display board with 32K of resident RAM that will display a 256 by 256 image with 16 grayscale shades, which can be used with virtually any computer, assuming software is available, to provide satellite image display.

How you get more resolution is a matter of the memory capacity of the host computer. In the case of my trusty Color Computer, which has little more available RAM than the display board itself, the solution is to sample smaller portions of the image at higher intensity. You may be limited in basic display capability, but there is nothing to stop you from displaying progressively smaller portions of the image at that same resolution, the result being that the patch you choose to look at can be displayed at the theoretical limits of resolution of the video format in question.

If you have more RAM available in the computer, the task is even easier, even if it requires some tricky memory management. In the case of an IBM PC or clone with 640K, for example, the entire image can be sampled and stored at essentially full resolution. Your basic display capability can then be used to view a sampled version of the whole frame or you can "zoom" in on the contents of memory for a more detailed look at any portion of the image.

A microprocessor-controlled scan converter can do many other things as well. It is possible to process the image for enhancement or any other purpose (the subject of a future column). You can generate false-color displays, images, or portions of images; you can save them to disk for later recall. The possibilities abound!

The only real drawback to a scan converter is obtaining a permanent copy of a picture of particular interest. Roll-film photography from a monitor is convenient since you already can see the image and hence the wait for the hard-copy version is rarely an issue.

Still another technique, largely unexploited, is to use a FAX machine to make your copy! Assuming the image is in memory, there is no reason why the computer, with the help of some external circuits, cannot output the image in a format the FAX machine can print without difficulty. Note that the computer controls the output function in this case, so there is no reason why the output format has to match the original image format! In effect, *any* FAX machine could print a satellite image as long as the computer could format the image for the machine in question.

A major advantage here, aside from being able to print out any satellite image on any FAX system, is that you need only print images of particular interest. With the FAX recorder alone, you must print the picture to see what it contains. If it is not particularly interesting, you have wasted the paper. With the scan converter, you get to watch *all* pictures, but need print only those you want.

If you want to build a FAX printer for your system, it will generally be less complex than a standalone recorder simply because the computer can handle many of the control functions that have to be hard-wired into a dedicated FAX recorder.

The future of scan converters is very bright, not only as the primary display system in a station but as a useful adjunct to other display systems. The flexibility of a computer-controlled display is also at the heart of any upgrade to a high-resolution VISSR display with GOES or HRPT display from the TIROS/NOAA spacecraft (see last month).

Picture of the Month

Since I have spent a fair amount of space talking about FAX, this month's picture is a photographic FAX print of an old NW WEFAX IR quad, printed on a photographic version of the FAX recorder described in the *WSH*.

Note

References to the *Weather Satellite Handbook* refer to the third edition, available directly from yours truly for $12.50 plus $1 shipping in the U.S. or $2 elsewhere.■

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73 INTERNATIONAL

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NOTES FROM FN42

Sri Lanka joins us this month—just in time for us to wish it a happy Independence Day (February 4). February 6 is Watangi Day (New Zealand Day), and the 11th is Founding of the Nation Day in Japan, where (according to The Economist *of London) the average income of the 121 million Japanese is now $17,000 per year. The magazine says that the average income of 242 million Americans is $16,000. All other aspects of this aside (as being irrelevant to this column), one reason for Japanese successes is that they learned a great deal from the United States—and we wish them a happy Founding Day. It now is appropriate to note that the time has come in the cycle of world affairs for the U.S. to learn from Japan. Which is a roundabout way to wonder out loud when JARL is going to name a foreign correspondent to this column—to help us start to learn how they do it. . . it is time, JARL, for you "to establish a horizontal relationship" with us. (To the Japanese businessman, that means dealing with the "horizontal" English language.) And the 11th of February also is the 139th birthday of Thomas Alva Edison, from whom everybody learned. Happy birthday, Mr. Edison, and many, many thanks.*

ROUNDUP

On November 3, 1986, the United States, at the stroke of a pen, became 17,000 people bigger. Huh, you ask? That was when, after more than 11 years of bureaucratic paper shuffling, the Northern Marianas (meaning all those islands except Guam) became a U.S. Commonwealth and the inhabitants became U.S. citizens. The KG6s, KG6Ts, KH0s, and KH2s on Tinian, Saipan, and Rota (to name the largest three islands affected) became U.S. hams. So send your congratulations; make Governor Pedro P. Tenorio an honorary ham. Make contact and collect a card dated during the first year of the new status.

A **Directory of Awards and Diplomas.** A booklet "listing full details of over 250 awards and diplomas" has been created by G1TZU, who sent us this information along with a couple of sample pages and the index. It is a fascinating list that appears to be organized alphabetically by country (with a slip here and there—in the index, anyway, where Austria is followed by Australia, Japan by Hungary, then Japan again—but these were probably draft pages that we got). The list starts with DX Widows Award (Australian?), goes through Worked All Malaysia, and ends with the San Cristobal Award (must be Venezuelan). The booklet is available for 3 pounds, U.S. $8, or 15 IRCs from Mrs. Sue Squibb G1TZU, 36 Frognal Gardens, Teynham, Sittingbourne, Kent ME9 9HU, England.

Sixteenth SARTG RTTY Contest Results. August's Scandinavian Amateur Radio Teletype Group 1986 World RTTY Contest results listed two U.S. stations in the top ten: WA7EGA in second place and WB5HBR in sixth place. Ten U.S. calls were among the 78 logs submitted. The top five in Class A (single-op), B (multi), and C (SWL) were:

A. G4SKA 219,600; I7FKO 218,435; HB9HK 211,560; SM5FUG 202,710; and EA5FKI.
B. LZ2KIM 316,220; WA7EGA 210,900; OH2AH 150,520; OH2OT 54,280; and YU2CRS 31,785.
C. OH-100 272,330; DE2QRV 214,360; ONL-383 98,100; Y2-2814/M51 77,140; and OH2-900 54,280.

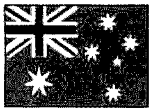
Our Global Electronic Village. An electronic global community began to form when the first wireless transmission was completed across a national boundary. Radio amateurs were its first citizens and still are sinews and muscles for this new mega-village. What part will amateur radio enthusiasts play in the future as TV becomes one of the strong links between all peoples everywhere? Hams have a common language and a common (technological) culture; this will not be the case with TV viewers. It is time to think about this because *before you are 15 years older* TV's biggest market in the world will be China, although at present, in China and India, where nearly half of the Earth's population lives, the "TV culture" is just now beginning.

Carlo Sartori, writing in *Panorama* [of Milan, Italy—excerpted in *World Press Review*, December, 1986], reports on TV's rapid growth since its birth in England in 1936. The U.S. was first to have a TV culture, then it came in the early fifties to industrialized Europe and Japan, the Communist bloc countries in the late fifties, and Latin America and Africa in the sixties. Some dates of nations getting TV: South Africa in 1976, Sri Lanka in 1979, Burma and Swaziland in 1980, Mozambique in 1982, Nepal in 1984, and now, Papua New Guinea.

In the U.S. today there are 300 private (non-network) stations; in Europe, national borders have no meaning to TV as a result of Murdoch's satellite Sky Channel (reaching six million homes in 10 nations), and other such endeavors (the British Superchannel, Brazil's Globa network out of Monte Carlo, and Ted Turner's CNN plans for Europe). Even state-controlled TV is going to be a part of the TV picture, according to Sartori, who reports that, for example, as early as 1979 the Communist Party Central Committee in Moscow condemned government-controlled TV for its "formalism, verbosity, propagandistic cliches, gray commentary style, and mechanical repetition of official truths to the detriment of creative interpretation." [Wow!!]

Look at what you started, radio amateurs of the world! What are you doing now to help the world's *people* understand each other as you understand each other already?

A global village? You bet! Look at the report from Ralf Beyer DJ3NW below. All about the Federal Republic of Germany? Nope. All about the Italian beacon robot, IY4M. And Rune Wande SM0CQP reports on the European License: more boundaries vanish. One world, coming to your neighborhood soon. . . .



An ALARA "Get-together" in September, 1984. L to R, front to back: VK-3DML, 2DIX, 7HD, 3DMS, 5ANW; 2DJO, 2PSC, 6YF, 3DVT, 5BYL; 3VAN, 4ACJ, 2PXS, 3VBK, 5YJ; 5AOV, 3NLO, 2KFO, 3BIR, 3KS; and Muriel May, 5QO and 3AYL. (Photo courtesy of Betken Productions)

AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

ALARA

On the 30th of June, 1975, a group of women interested in amateur radio met in Melbourne and formed the Ladies' Amateur Radio Association, now A(ustralian) LARA. Norma VK3AYL (now VK2DJO) was foundation president. With more than 200 members today, ALARA's main aim has been to encourage the active participation of women in amateur radio. ALARA has an award, contests, trophies, numerous nets, and a quarterly newsletter.

The official net is on ±3.580 MHz at 1030 UTC Mondays (1000 during daylight saving time), linking YL operators all over Australia. The net allows YL newcomers to try their hand—to overcome mike shyness and say hello. All are welcome. The monthly meetings are held on the net on fourth Mondays (except in December).

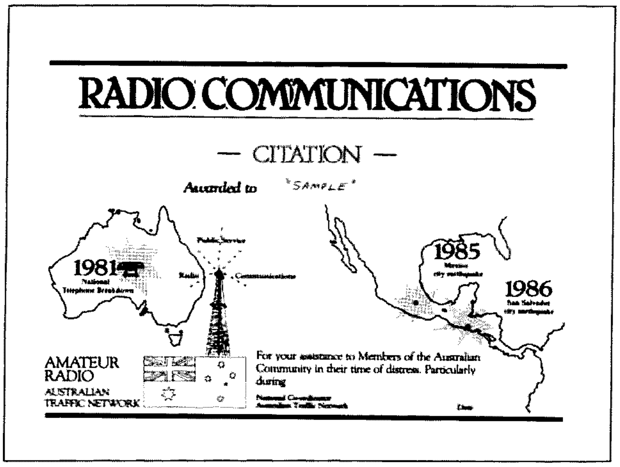
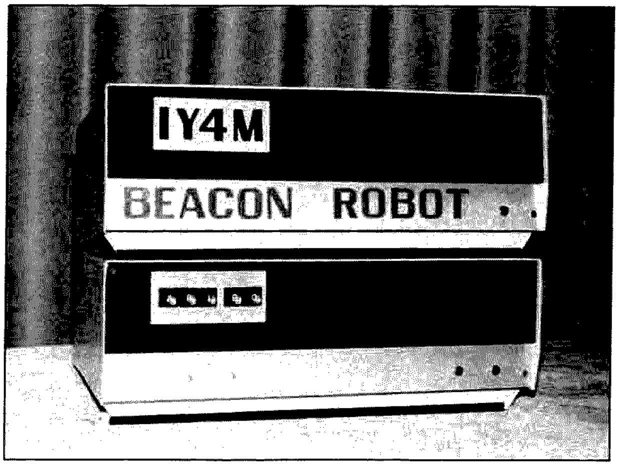


Fig. 1.



Beacon robot IY4M.

Other nets, conducted by ALARA or other YLs, include:

•YL DX "220" net, Mondays, 0600 UTC, 14.220 MHz.

•"Open House" System, Tuesdays and Thursdays, 0900–1200 UTC in winter and 1000–1300 in summer, ±14.332 MHz.

•15-meter net, Fridays, 0400 UTC, 21.188 MHz.

•Queensland net, Wednesdays, 1000 UTC, ±3.563 MHz.

•WA ALARA/YL net, Mondays, 1200 UTC, ±3.585 MHz.

•CW: Wednesdays, 0430 UTC, 7.030 MHz (VK3KS, VK2SU), and Mondays, Thursdays, Fridays, 0300 UTC, 14.050 MHz (VK3KS, VK4BSQ, VK4ATK).

ALARA has its own song and much recruitment material. They have their own lapel badge, charms suitable for necklaces, bracelets, etc., and teaspoons (and sugar spoons) with their emblem (a great collector's item). When a member signs off, the farewell is "33." This was originated by Clara W2RUF (SK) and adopted by the American Young Ladies Radio League for exclusive YL use; it means friendship between YLs.

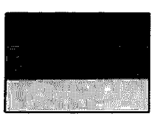
Interested YLs may write to: The Treasurer, ALARA, PO Box 4, Middle Brighton, Australia 3186.

I am indebted to the ALARA Publicity Officer, Joy VK2EBX, for most of this information.

* * * * *

A Radio Communications Citation. VK2BVS writes that by now citations have been sent to all persons and organizations in the amateur radio field who were known to have helped handle Australian messages during (1) the national Australian telephone breakdown, 10–17 June 1981, and/or (2) the Mexico City earthquake disaster, 21–25 September 1985, and/or (3) the San Salvador City earthquake disaster, 11–19 October 1986. Inevitably, however, in operations of such magnitude, participants may be overlooked, be unknown, or have moved or changed callsigns since. Therefore, the citation is now being offered as a general award. Eligible are all Mexican radio amateurs involved in 1985, all El Salvador amateurs involved in 1986, and any overseas amateurs who helped Australian messages to flow, plus any who helped amateurs originate, relay, or deliver such messages over the air, by telephone, or by any other means, or provided updates to national or governmental organizations or to the media. This includes assistance at net control or relay stations, CB operators delivering or collecting local-area messages, and members of the general public whose special help has been acknowledged.

To obtain the citation (see Fig. 1), send details of your involvement together with $5 to Sam Voron VK2BVS, 2 Griffith Avenue, Roseville, N.S.W., Australia 2069.



FEDERAL REPUBLIC OF GERMANY

Ralf Beyer DJ3NW
Opferkamp 14
3300 Braunschweig
West Germany

Frequent short-skip conditions on 10 meters gave dozens of amateurs in Europe a chance to log on the Italian beacon robot, IY4M, recently. So it is time to get ready to contact the robot from other continents, too, in case of short band openings now and then and generally better conditions to be expected in the long run.

The beacon is sponsored and managed by the Associatione Radioamatori, Sezione di Bologna, Italy. It is dedicated to the remembrance of the great Italian scientist and pioneer, Guglielmo Marconi, who established the first radio contact over the Atlantic on December 12, 1901, between Newfoundland, Canada, and Poldhu, in Cornwall, England. The beacon is near the Villa Griffone at Pontecchio Marconi, in Bologna, Italy, where young Guglielmo made his early radio experiments, and from where the first radio signals originated.

Purposes of the beacon include: to serve as a reference for propagation studies and antenna tests, as a signal source for receiver checks, and to broadcast information and bulletins of general interest. Another rather unique purpose is to communicate with users and collect data on stations that operate the beacon. Normally, a computer and modem are required to get in contact with such a machine. IY4M, however, communicates in Morse code, so everyone is ready for a QSO with him.

IY4M operates on 28.195 MHz in CW with a normal output power of 20 Watts and a 5/8-wave ground-plane antenna. It identifies itself by sending IY4M twice, followed by the intermittent signal (——————— ——— ——————— ——) followed by the message, IY4M ROBOT QRV QRV, at 15 wpm code speed. If a command is received within 30 seconds, it will be executed by the machine; otherwise, the cycle repeats. The robot adapts automatically to your code speed, which may be within the range of 10 to 50 wpm: it answers at the same speed with which it is approached by the user. The bandwidth of the receiver is about ±2590 Hz, centered on the nominal frequency of 28.195 MHz.

A short QSO with the robot is initiated by sending on his frequency in CW a message like:

IY4M IY4M DE DJ3NW DJ3NW K

The robot checks the syntax of the callsign received. For instance, if you send HELLO instead of your call, the robot will answer:

HELLO HELLO ? ? PSE AGN

If a correct call is received once only, the robot answers:

DJ3NW DJ3NW ? ? PSE AGN

If the robot doesn't understand the call at all, it answers:

? ? PSE AGN

If the initiating message is accepted, the robot answers:

DJ3NW DJ3NW DE IY4M—HR OP ROBOT—TKS FER CALL NW STORED IN MEMORY—NW PSE SEND SIG ES WL GIVE U RPRT BK.

At this point, send a signal (dots, dashes, or carrier) for about four seconds. The robot then answers (for example), R UR RST IS 55 55, and asks, NW PSE MY RST RST ? ? BK, and expects that you will give a report (RST) at least twice, ending with a well-spaced letter K. The robot then answers, R R TKS FER (RST) and terminates the QSO by saying good-by in one of these languages, selected according to your callsign: English, Italian, Spanish, French, German, Swedish, Finnish, Japa-

Keyword	Response	Action
QRP K	IY4M QRP PWR 2W OUT	Output power is switched to 2 Watts and is reset to 20 Watts again if the robot identifies itself.
QRO K	IY4M QRO 20 W OUT	Normal output power of 20 Watts is restored.
QTG K	An intermittent signal is sent for about 15 seconds.	
QSA K	R R	The user should now send a signal for about 4 seconds, and the robot responds, for example, UR S 5 5, or SRI NIL if the received signal is inadequate for some reason.
QTC? K	QTC ... / ... / ... STORED	Robot tells you which messages (1–5) are currently stored, or it answers, NO QTC STORED.
QTC 1 thru 5 K		Robot transmits the requested QTC at the user's code speed, but not slower than 18 wpm.
INFO K	IY4M AT (hour and date in UTC) FQ 28195 KHZ QRO (QRP) 20 (2) W OUT ANT GP 5/8 LOC JN54OK CODE SPEED ... WPM ... TEMP (MINUS) ... C	
LIST K	V V V LIST OF QSO AT (hour and date in UTC) followed by a list of all QSOs stored, at 50 wpm.	Each entry is listed by time, date, callsign, RST sent or ?, RST received or ?, and robot output power: 0–20 Watts, P-2 Watts.
LIST L K	Same but at 30 wpm	
MSG 1–4		Transmission of a stored message at your code speed but not less than 18 wpm. MSG1: list of keys; MSG2: list continued; MSG3: How to operate the robot; MSG4: Guglielmo Marconi celebrating message.

Table 1. Commands accepted by IY4M.

nese, Serbo-Croat, Russian, and Portuguese.

In addition, the robot accepts a number of keywords and responds to them—see Table 1.

You can operate the robot quite easily if you follow these recommendations:

•To be sure you are heard by the robot, send some Vs followed by a well-spaced letter K. The robot answers, ? ? .

•Sending a couple of Vs at the beginning of each transmission helps the robot to synchronize with your speed.

•Each key can be repeated several times to cope with QRM. However, the time limit for a command is 30 seconds.

•End each command with a well-spaced letter K. If the robot does not respond, he may not have received the K properly. Send another K. Otherwise, start all over again.

•Keywords and callsigns must be transmitted without spaces. DJ3NW rather than DJ 3 NW, for example.

A special QSL card is sent to all stations logged by the robot.

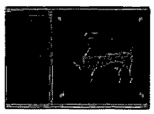
Beacon robot IY4M was designed and built by IK4BWC, I4DVT, IK4EWK, I4IJY, and I4TNM, with the cooperation of I4ACO, I4BER, I4BUA, IK4CZF, I4NE, I4QHD, and I4TA.

The idea to build the machine came from Marco De Vietro IK4EWK and his father, I4DVT. Two years ago, Marco began with an Apple II computer and a simple program in Forth which was able to decode a CW signal from the computer I/O port, to recognize a command, and to execute it. Later, the gang of IY4M built a dedicated computer, clock, A/D converter, receiver, and interfaces to get IY4M on the air.

There are more features to come. "We would like to build a completely new computer for the robot, based on an MS-DOS operating system," Marco says. "The primary goal [would be] to make the system smarter in recognizing commands and callsigns even with the wrong spacing between letters or words." New commands may include a Morse tutor, a mailbox, or a facility to vary the transmitter output power over a wide range. And PROLOG, one of the artificial intelligence languages, is already considered a candidate to implement the improvements.

I really love to get in contact with IY4M and enjoy the way it provides everyone with access to an intelligent machine by the simplest type of radio communications of all—good old CW. Thanks to the crew of IY4M for a job well done!

And thanks to Marco De Vietro IK4EWK for the information on IY4M.



SRI LANKA

Calvin Fernando 4S7CF
15/6, Albert Perera Avenue
Nugegoda
Sri Lanka

(Welcome to Calvin 4S7CF of the nation of Taprobane (as it was known to the ancients), Serendip (as it was known later), Ceylon (as known in modern times—until 1972), and the Republic of Sri Lanka, as it is known now—a 25,332 square-mile island in the Indian Ocean off the SE coast of India. Calvin is a vice-president of the Radio Society of Sri Lanka and is active on 20 when the band is open. (He has all 50 U.S. states confirmed.)

The Radio Society of Sri Lanka had its annual meeting in August and elected R.E.H. Perera 4S7EP (Earnie) as president, 4S7CF and R. Gunawardene 4S7RR (Ranjit) as vice-presidents, and the following: Ekendra 4S7EF, Hon. Secretary; D.P. Pathmaperuma, Hon. Treasurer; Victor 4S7VK, Editor; and Rodney 4S7RM, Auditor. Committee members are Warne 4S7PW, Ananda 4S7NB, Paul 4S7PVR, Cecil 4S7CD, Vasantha 4S7VG, A.C.S. Jayaranjan, and H. Buddadasa.

Amateur radio is more than 50 years old in Sri Lanka, and is growing slowly. About 150 hams are licensed, of whom about 30 are active, a few of them DXers. The RSSL issues a Worked Ten 4S7 Stations award to any licensed amateur. (Send 10 IRCs and certified log extracts to Awards Manager RSSL, PO Box 907, Colombo, Sri Lanka.) The QSL bureau is also at this address.

A license to operate may be issued to visiting hams if application is made at least three months before arrival [Calvin offers his help; contact him]. No third-party traffic is permitted.

Most hams visiting Sri Lanka visit our society get-togethers. Recent interesting visitors included OM Karl DDJ2NH, who donated the only 2m repeater, at present (receives on 145.000 MHz, transmits on 145.60), and OM Minoru JA3MNP, who has sent us about 25 2-meter rigs collected from JA hams as presents for our hams.

We have never had visiting DXpedition groups, but it will be a good idea. If you will let us know specific plans, I can put it up to the RSSL and see how we can give our cooperation. Our club station uses 4S0AA during the All Asia DX Contest.

I like your magazine very much but it is very seldom that we see a copy. Best 73. . . .

A one-year subscription has been entered for the RSSL as "International's" foreign correspondent, through its representative, 4S7CF.

SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn
Sweden

CEPT LICENSE

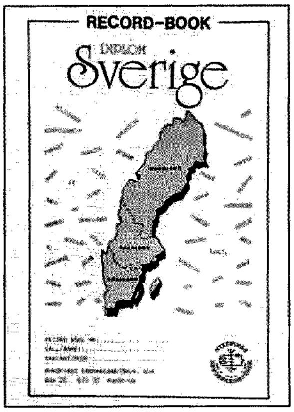
By the time you read this, the European License according to the CEPT Agreement should have been accepted by the Swedish Telecommunication Authority. This will mean that amateurs in those European countries that have accepted the CEPT Agreement no longer have to apply for a reciprocal license when traveling on vacation and bringing the radio with them. I will confirm this in a future report and give specific information on which countries this applies to. Others must continue to follow the reciprocal licensing procedure.

THE SWEDEN AWARD

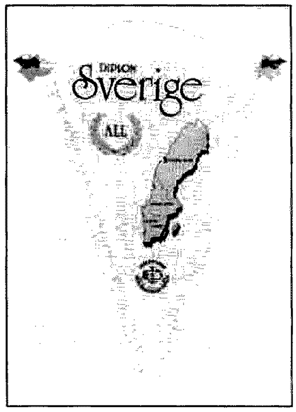
We all know that amateur radio is a greatly diversified avocation. Regardless of our prime interest within the field, we sooner or later get into the game of hunting for awards. At one time, it seemed like every radio club was running its own award. Some awards are regarded as very prestigious, while others may be just a nice decoration hanging on the wall.

Some seven years ago, the Sweden Award was established by the radio club Nykopings Sandareamatorer. The prime purpose was to increase the low amateur activity on the 80-meter band. More or less to everybody's surprise, this activity has been ever increasing throughout the years and has attracted more and more amateurs. It also has developed into more than just hunting for an award. Those who take part become very good friends and even arrange annual meetings which have become very well liked.

Collect 100 Parishes. The smallest administrative geographical area in Sweden is a parish. In all there are 2,563 parishes, but for the Sweden Award, you must work only 100 different ones. If you are trying for additional stickers or even heading for "Worked All Swedish Parishes," you must follow the mobile activity going on. The most amazing thing with this award has been the increasingly big mobile activity. The performance of the mobile setups is astounding. It has even been possible for stations in the most southern part of Sweden to work mobile stations north of the Arctic Circle on the 80-meter band, a distance of 1,500 kilometers (940 miles). Summertime and Midnight Sun have not really favored the propagation on these low frequencies, but the avid award hunters have done it anyway.



The Record Book cover.



The pennant awarded for working all parishes.

Another thing to be pointed out is the operating technique that has been developed. It reminds us a lot of a DX pileup, but here it is mandatory that each station giving a report also repeats the report received. Very often somebody else keeps the log when a mobile station is involved in the activity. You may, however, collect parishes during regular QSOs which, of course, are valid for the award.

For many amateurs it is a learning experience of many kinds to take part in this award-hunting activity. One is that you have a chance to get a good knowledge of Swedish geography. It is very interesting to look up on a map to find out where the station you worked is located.

U.S. County Award Similarities. The Sweden Award has similarities with the very popular U.S. Counties Award [sponsored by *CQ*]. The first one to work all parishes was Nils SM0TW. He is still active helping others to achieve the same goal. The last few years, Elvir SM7HZZ has been the leading enthusiast. He has worked over 15,000 QSOs from 1,300 parishes being mobile! From his home station, he is usually the one directing the net. This last summer, Olle SM6CVL has covered most parts of South Sweden, running mobile from over 1,000 parishes.

Record Book Required. To date, over 1,500 Record Books have been sent out. So far, 61 amateurs have worked all parishes. The first one outside Sweden was Harald LA9VK, who received the Worked All No. 40. A Record Book is required, and has to be sent to the club together with the application for this award. The charge is 35 Swedish Kroner plus postage (approx. U.S. $5 plus postage). Send for further information from NSA Diploma Manager, Box 25, S-611 22 Nykoping, Sweden.

A QSL card exchange is not required for this award, but NSA reserves the right to examine log entries. All Record Books are given an ID number. All amateur bands and modes may be used to work Swedish stations, although the most popular frequency for mobile activity is 3,760 kHz. There also is a special mobile trophy and a CW trophy. After the minimum 100 parishes required for the basic award, there are stickers for 500, 1,000, and ALL. A beautiful pennant is issued when all parishes have been worked.

Although this award is, of course, easiest to achieve for amateurs in Sweden and its neighboring countries, there are quite a few Record Books in other European countries and in the U.S. Why don't you start collecting parishes? In Swedish, a parish is called a *forsamling*. When you work CW, ask for the "FG." Write for your Record Book and for all the information you will need for the Sweden Award. ■

1986 15/20-METER SSB CHAMPIONSHIP RESULTS

DL6FBL, N5TR, and K5LZO
—20-Meter World Champions—

Superbowl Syndrome! That was the order of the day as dedicated contesters worldwide chose to take to the airwaves instead. Normally we would have scheduled the 80- or 160-meter events on this football weekend, but the NFL announced their schedule much later in the season than they normally do. *73* had already scheduled the contesting events.

Despite the odds, DL6FBL literally walked away with World Championship honors. His single-operator DX entry included 1,180 QSOs, 55 states and provinces, 108 DX countries, and 1,801,150 contest points! Fantastic score—the highest in the contest! Great job, Ben!

This year's runner-up is a newcomer to

Overall Winners—Single Operator:			
USA	NR5M	85	1,082,950
Canada	VE3BVD	86	645,465
DX	DL6FBL	86	1,801,150
Overall Winners—Multi-Operator:			
USA	K5LZO	85	932,815
DX	GW4EZW	86	109,620
W/VE Stations—Single Operator:			
AR	WB5KED	86	82,565
CA	WA6FGV	85	288,800
CO	WØIZV	85	34,400
CT	KA1YR	86	233,100
DE	AC3T	85	60,672
FL	K4XS	85	296,825
GA	WS4N	86	82,640
IA	KDØHY	85	41,520
IL	W9REC	88	3,850
IN	KBØC/9	85	1,380
KS	WBØWHB	85	191,100
KY	KI4UJ	86	36,960
MA	KA1GG	86	918,380
MD	N3AOE	85	29,250
ME	KR2K/1	85	1,875
MI	N8CXX	85	145,140
MN	WØNGB	86	7,425
NC	KF4HK	86	55,000
NE	KVØI	86	211,670
NH	AF1T	85	50,840
NJ	WB2ULI	88	793,860
NM	AI9X	86	22,500
NY	KA2VAJ	86	33,250
OH	WD8DVX	86	38,850
OR	NI7T	85	296,400
PA	W3ARK	86	41,370
TX	NR5M	85	1,082,950
VA	W4WJJ	85	117,410
VT	W3SOH	86	7,250
WA	N7BES	85	425,655
ALT	VE6CPP	86	32,745
NS	VE1BDT	85	164,900
ONT	VE3BVD	86	645,465
W/VE Stations—Multi-Operator:			
CT	KA1YR	85	360,500
IN	KE9T	86	453,600
KS	WBØOIZ	85	96,460
LA	KD5RW	86	286,900
OR	NK7U	86	435,590
TX	K5LZO	85	932,615
WA	KE7C	85	559,860
WY	KB7M	85	20,125
DX Stations—Single Operator:			
Alaska	KL7U	86	141,345
Australia	VK2BQS	85	16,500
Balearic	EA6VO	85	222,950
Brazil	PT2TF	86	114,700
Bulgaria	LZ1YEW	85	272,480
Canary Is.	EA8VV	86	32,760
Czech.	OK1RI	86	555,660
Hawaii	KH6DW	86	623,310
Honduras	HR1FC	85	15,225
Indonesia	YBØZEA	86	270
Israel	4X6IF	86	140,800
Italy	I4UFH	85	164,125
Japan	JK1MAZ	85	186,260
New Caledonia	FK8FA	86	120,750
Portugal	CT1DIZ	86	3,440
Puerto Rico	KP4FI	86	749,840
Scotland	GM4WEW	85	4,600
Spain	EA3BOX	66	128,076
Sweden	SM7NNJ	85	9,450
UN HQ	4U1UN	85	4,880
Wales	GW4BLE	86	612,720
W. Germany	DL8FBL	86	1,801,150
Yugoslavia	YU7SF	86	1,100
DX Stations—Multi-Operator:			
England	G4CVK	86	35,550
Finland	OH7AI	86	31,785
Japan	JA7YCO	85	38,340
Wales	GW4EZW	86	109,620

Table 1. 20-meter honor roll—all-time record holders. (Columns show QTH, callsign, year, and score.)

World 20-meter single-op DX champion DL6FBL.

20-meter DX single-op runner-up AH6GO.

the contest community. She promises to be a threat any time she's on the band. Meet Helen AH6GO. This was Helen's first or second (can't remember which) contest entry. Heard her a few weeks later, and she was among the top WPX scorers, too!

Station N5TR, operated by WB5VZL, is the World Champion for W/VE single-operator stations. George's station accumulated 1,349 QSOs. His Q-count and DX country totals (70) were more than runner-up station KA1GG could handle. A total of 21 multipliers separated the two.

Chuck K5LZO is the Multi-Op World Champion for the second consecutive year. Chuck worked more stations (1,365) than any competitor. Together with 55 states and provinces and 56 DX countries, a total of 842,490 contest points were tallied.

So here is what the record book looks like at the end of our second annual 20-Meter World Championship event:

	1985	1986
W/VE Single Operator:	NR5M	N5TR
DX Single Operator:	OK1TN	DL6FB
W/VE Multi-Operator:	K5LZO	K5LZO

Each year brings new champions. Here is a glance at the top-ten QSO record holders for 20 meters:

Single Operator:

NR5M	1985	1,690
N5TR	1986	1,349
KA1GG	1986	1,193
DL6FBL	1986	1,180
AH6GO	1986	1,139
KP4FI	1986	984
VE3BVD	1986	943
KA1GG	1985	924
W5FO	1985	913
W1BR	1985	904

Multi-Operator:

K5LZO	1985	1,473
K5LZO	1986	1,365
KE7C	1985	1,171
NK7U	1986	898
KE9T	1986	601
KD5RW	1986	576
KA1YR	1985	501
KD5RW	1985	411
WB0OIZ	1985	343
GW4EZW	1986	216

K5LZO led the pack with 1,365 QSOs. Following him with 500 or more contacts were: N5TR (1,349), KA1GG (1,193), DL6FBL (1,180), AH6GO (1,139), KP4FI (984), VE3BVD (943), NK7U (898), KH6DW (808), WB2ULI (720), GW4BLE (707), KV0I (676), WA6FGV (671), OK1RI (588), and KD5RW (576).

Certain states and provinces were at a premium. Canadian participation was extremely rare on the East Coast. Nobody managed to work all 61 multipliers. N5TR came the closest with 57. Others with 50 or more included: DL6FBL, K5LZO, and KE9T each with 55; KA1GG and AH6GO with 54; KH6DW and WA6FGV with 52 each; KP4FI (51), and WB2ULI (50).

There were a lot of DX stations on the air this year. Unfortunately, the stateside turnout was extremely low because of the Superbowl. So if you missed a new one, blame it on Pete Rozelle! Stations with 50 or more DX countries included: DL6FBL (108), WB2ULI (81), N5TR (70), OK1RI (68), KP4FI (61), JK1MAZ (59), VE3BVD (57), K5LZO (56), KA1GG (54), KE9T (53), and GW4BLE (52).

Though participation was lower than anticipated, we did see some world records broken. Many contestants became leaders in

Single Op:				
DL6FBL	West Germany	TS-930S	Alpha 77DX	6 elements at 100'
AH6GO	Hawaii	TS-430S	Harris/RFC	5 elements at 70'
N5TR	Texas	TS-930S	Alpha 77D	4 elements at 200' 5 elements at 175' 5 elements at 100'
KA1GG	Massachusetts	TS-940	H.B. 8877	3 elements at 110' 3 elements at 55'
WB2ULI	New Jersey	TS-530S	Clipperton-L	4 elements at 80'
Multi-Op:				
K5LZO	Texas	TS-430S	Alpha 77D	5 elements at ? 4 elements at ?
KE9T	Indiana	TS-430S	MLA-2500	6 elements at ?
NK7U	Washington	TS-930S	Alpha 78	Unknown
KD5RW	Louisiana	FT-901DM	SB200	4 elements at 100'

Table 2. Equipment of the top-five single- and multi-op 20-meter stations

1986 20-METER WORLD SSB CHAMPIONSHIP

Callsign, QTH, QSOs, states and provinces, DX countries, total score

** = World Champions; * = State, Province, Country Champions

W/VE—Single Operator:					
** N5TR	TX	1,349	57	70	1,007,745
* KA1GG	MA	1,193	54	54	916,380
* WB2ULI	NJ	720	50	81	793,860
* VE3BVD	ONT	943	54	57	645,465
* KA1YR	CT	429	35	35	233,100
* WA6FGV	CA	671	52	12	224,000
* KV0I	NE	676	42	19	211,670
* KC7QP	WA	448	45	25	185,150
* N0CLV	KS	332	39	11	84,000
* WB5KED	AR	330	42	7	82,565
* WS4N	GA	156	34	24	62,640
* W4WKQ	FL	212	33	17	59,250
* W5PWG	TX	266	39	4	57,190
* KF4HK	NC	145	29	26	55,000
K5ZD/1	MA	160	32	16	51,120
* AF1T	NH	213	42	0	44,730
* W3ARK	PA	164	29	13	41,370
* WD8DVX	OH	158	24	18	38,850
* KI4UJ	KY	101	30	26	36,960
* KA2VAJ	NY	103	31	19	33,250
* VE6CPP	ALT	170	33	4	32,745
* AI9X	NM	123	32	4	22,500
KJ4LU	NC	83	21	14	19,425
WK4F	FL	63	27	11	13,870
K4GKV	GA	55	19	16	13,475
WA5IYX	TX	55	28	3	8,835
W0NGB	MN	49	23	4	7,425
W3SOH	VT	44	21	8	7,250
WE6G	CA	45	26	3	6,960
W0IZV	CO	35	31	4	5,265
W9REC	IL	30	16	5	3,850
N5AFV	TX	28	15	4	2,945
NF2C	NJ	20	11	2	1,300
K5GN	TX	7	6	0	210

(Checklog: KJ4NC, AE6T.)

DX—Single Operator:					
** DL6FBL	West Germany	1,180	55	108	1,801,150
* AH6GO	Hawaii	1,139	54	49	1,083,045
* KP4FI	Puerto Rico	984	51	61	749,840
KH6DW	Hawaii	808	52	27	623,310
* GW4BLE	Wales	707	40	52	612,720
* OK1RI	Czechoslovakia	588	40	68	555,660
* JK1MAZ	Japan	299	8	59	186,260
* KL7U	Alaska	263	49	32	141,345
* 4X6IF	Israel	266	16	39	140,800
* EA3BOX	Spain	248	33	19	128,076
* FK8FA	New Caledonia	273	10	40	120,750
* PT2TF	Brazil	184	28	45	114,700
* EA6TC	Balearic Is.	198	10	23	36,630
EA7AVU	Spain	170	12	25	34,040
EA8VV	Canary Is.	84	34	5	32,760
G0ASM	England	77	11	23	18,360
I4CSP	Italy	59	16	19	17,850
JA2MNB	Japan	60	6	21	14,985
JA1BNW	Japan	62	4	21	13,875
JE1AER	Japan	32	2	16	5,040
OK3YK	Czechoslovakia	27	8	10	4,300
CT1DIZ	Portugal	35	5	11	3,440
LZ1BG	Bulgaria	27	2	10	1,800
JH3DEJ	Japan	15	1	12	1,625
YU7SF	Yugoslavia	15	2	9	1,100
OK1KZ	Czechoslovakia	10	1	8	810
JA2BNN	Japan	12	3	5	800
EA5EFV	Spain	12	5	2	695
LZ1WY	Bulgaria	10	1	7	480
OK1KUZ	Czechoslovakia	7	4	2	390
YB0ZEA	Indonesia	10	0	3	270
JA1AAT	Japan	7	1	3	200
YU7MGU	Yugoslavia	5	2	3	175
JE1GZB	Japan	8	0	3	150

W/VE—Multi-Operator:					
** K5LZO	TX	1,365	55	56	842,490
* KE9T	IN	601	55	53	453,600
* NK7U	OR	898	49	37	435,590
* KD5RW	LA	576	49	36	266,900
K7LXC	WA	21	13	2	1,650
DX—Multi-Operator:					
* GW4EZW	Wales	216	32	31	109,620
* G4CVK	England	105	22	23	35,550
* JA9YBA	Japan	102	7	27	32,810
* OH7AI	Finland	139	7	32	31,785
JA2YEF	Japan	45	5	20	11,310

(Checklog: JA3YKC.)

Multi-Operator Participants:

G4CVK	G4IEB, G0AGH, G4XOM
GW4EZW	GW4EZW, ?
JA2YEF	JI2LPD, JI2QVF, T. Yamamoto
JA3YKC	JR6NWN, JI3ERV
JA9YBA	JH7UJR, JA9LNJ, JA9VDA
K5LZO	K5LZO, KE5IV, NT5D, NM5M
KD5RW	KA5DLM, KA5BOO
K7LXC	K7LXC, KB7TAD
KE9T	KE9T, WB9YBI, N9FGM
NK7U	NK7U, NI7T
OH7AI	OH7BY, OH7EV, OH7HK, OH7UV

20-METER SOAPBOX

4X4IF	Never recalled a contest in which I worked so hard and did so poorly. Conditions were simply awful. We'll certainly welcome the return of the sunspot maximum.
AH6GQ	Had no plans to enter the contest, just participate. After two hours, I decided to go for it and had lots of fun!
DL6FBL	Thanks for the contest! The greatest was the big number of exotic DX stations. I worked countries I have never heard before in a contest.
EA6TC	The antenna rotor was torn because of 45-kph winds.
G0ASM	Conditions were quite good considering the sunspot cycle.
GW4BLE	Enjoyed the contest. Like the 24-hour format.
KA1YR	Great contest. More participation this year. Looking forward to next year.
KJ4LU	20 meters with 100 Watts in a contest is like working QRP with a half-wave dipole in the basement.
KH6DW	I believe in ten hours of operating I worked everyone who could hear me and everyone I could hear. I certainly will be back next year.
KE7C	Superbowl got in the way this year! Usually 80- or 160-meter contests are run on Superbowl Sunday. Guess we goofed up the schedule. Promise to resolve the problem in '87.
KV0I	Propagation sure was lacking to Europe and JA from the Midwest.
KP4FI	Nice to work the contest. My first SSB contest.
WB2ULI	Superbowl + TVI don't mix!
W4WKQ	Enjoyed this 20-meter event better than any other SSB contest on the band.
YU7SF	This is my 1,005th contest and first 20-meter phone!

their respective state, province, or DX country. Analyze the 20-meter honor roll (Table 1). Enter your station next year and perhaps your name will be among those mentioned!

It seems on 20 meters that if you don't have the skies filled with aluminum, you'll never make the grade. In this contest, there is no room for compromises. You need a good operator, lots of aluminum, a rig that will filter the QRM, and at least 1,500 Watts to meet the competition head-on. Table 2 shows what the top stations were running.

I don't know what you do during the summer, but around here it is antenna weather. I now have three 5-element arrays up for 20 and a tribander just for standby. I'll see how they play in '87. As for the rest of the contesters, here is a sampling of the antennas they used on 20 meters during the '86 event and their percentages:

3-element yagi	26.5
4-element yagi	16.5
6-element yagi	16.5
Inverted vee/dipole	12.0
Vertical	10.5
5-element yagi	9.5
7-element yagi	4.5
2-element quad	1.5
2-element yagi	1.5
Delta loop	.5
4-element quad	.5

From these statistics, it looks as if I'd better upgrade my system just to stay up with the rest of the field. Where are all the tribanders? Last year they represented 45% of the configurations in use. Hmm, very interesting! You think maybe they upgraded to monobanders?

We all owe our gratitude to Chuck WA6R, our 20-Meter Contest Chairman. Chuck, like our other contest committee members, has the thankless job of tallying all the entries, issuing the certificates, catching flack when your score fails to show up in the magazine, and filling out all these ridiculous reports about his contest committee activities as the months go by. If you had a good time, thank Chuck; he's the one responsible. In 1987, who knows, he may open up a new category for hooking the big ones. Thanks, Chuck.

KM5X, K5LZO, OK1RI, and KH6DW —15-Meter World Champions—

It was another Texas showdown. While the majority of the world suffered with poor band conditions, stations in Texas were nabbing contacts like they were going out of style. As the sun set in the west (2400 UTC), the stations in Texas clearly took home the bacon!

KM5X is World Champion in the single-operator category. Following with his very close and exciting second was NR5M. At the finish, only eight QSOs separated the two stations. KM5X had the advantage of ten additional multipliers to take the overall lead by 80,000 points. VE3BVD became the highest scoring Canadian station, finishing 3rd in the single-operator class.

OK1RI became the World Champion for DX single-operator stations by earning a respectable 441,600 points, including 65 DX countries worked. Comparing all contest entries, OK1RI had the second highest score in the world. A superb effort from our most sought-after European friend. Great job! JG1FVZ/5N0 took a commanding second-place finish by handing out Nigerian multipliers to the deserving 333 stations he contacted. Our thanks for this African entry.

K5LZO retains his title by becoming the World Multi-Op Champion for the second consecutive year. Chuck, another Lone Star station, is a fierce competitor. Not only has he dominated this event since its inception, Chuck is also the World 20-Meter Multi-Op Champion. Need I say more?

Well-known Hawaiian station KH6DW, with an assist from K7SS, took the World Multi-Op Championship in the DX class. Frank and Danny went unchallenged throughout the event. For the most part, propagation seemed poor to most parts of the world. While multipliers were at a premium, they managed to make 618 contacts, the most stations worked by any competitor. As usual, great job, guys! You're a class act!

Analyzing this year's results, here are the current top ten world 15-meter QSO record holders:

Single Operator:		
K4XS	1985	706
KM5X	1985	583
KM5X	1986	548
NR5M	1986	540
WA6FGV	1985	511
K7QQ	1985	463
WA7COE/DV2	1986	461
K4VXO	1985	434
VE3BVD	1986	404
JG1FVZ/5N0	1986	333
Multi-Operator:		
K5LZO	1985	759
KH6DW	1986	618
K5LZO	1986	521
WD5GSL	1985	394
KD5RW	1986	298
KD5RW	1985	295
WD5GSL	1986	228
KE7C	1985	206

As mentioned, multipliers were at an absolute premium. Leading the pack with state and provincial tallies were NR5M (50), KM5X (49), K5LZO (48), KC2EE (44), KD5RW (42),

Single Op:				
KM5X	TX	TS-940S	Alpha 77D	5 over 5 Telrex at 135'/190'
OK1RI	Czech.	FT-102	HB 500W	4 elements at 72'
NR5M	TX	TS-930S	Alpha 77D	6 over 6 KLM at 80'/115' 6-element KLM at 95' 5-element Hy-Gain at 45'
VE3BVD	ONT	TS-930S	SB-220	5 over 5 at 70'/140'
JG1FVZ/5N0	Nigeria	TS-120S	FL2100Z	4-element triband yagi
Multi-Op:				
K5LZO	TX	TS-430S	Alpha 77D	6-element KLM at 145' 6-element KLM at 54'
KH6DW	HI	TS-930S	TL922A	6-element KLM at 70'
KD5RW	LA	FT-901DM	SB-200	4-element KLM KT34A at 100'
WD5GSL	TX	S-Line	Alpha 76	13-element log periodic

Table 3. Equipment of the top-five single- and multi-op stations.

Overall Winners—Single Operator:			
USA	K4XS	85	514,000
Canada	VE3BVD	86	225,640
DX	OK1RI	86	441,600
Overall Winners—Multi-Operator:			
USA	K5LZO	85	457,960
DX	KH6DW	86	333,575
W/VE Stations—Single Operator:			
AL	KB4JSS	85	2,700
AR	W5EIJ	85	1,755
CA	WA6FGV	85	151,840
CO	W0IZV	85	3,135
DE	AC3T	85	50,235
FL	K4XS	85	514,100
GA	K4GKV	86	3,145
IA	KD0HY	85	29,040
IL	K4VX/0	85	229,245
IN	W9RE	85	39,270
MD	K3ZO	86	4,590
MI	N8CXX	85	102,510
MN	W0NGB	85	490
MO	WB0OIZ	85	9,750
NC	N4UH	85	31,080
NE	KV0I	86	10,800
NJ	NF2C	86	275
NY	KX2J	86	3,060
OH	WD8DVX	86	3,870
PA	W3ARK	86	3,120
TX	KM5X	86	458,780
UT	NJ7A	86	640
VT	W3SOH	86	3,800
WA	K7QQ	85	175,070
WI	W9XT	85	32,600
WY	KB7M	85	2,665
NWT	VE8RCS	86	140
NS	VE1BDT	85	22,680
ONT	VE3BVD	86	225,950
W/VE Stations—Multi-Operator:			
FL	WC4E	85	46,060
LA	KD5RW	86	134,050
TX	K5LZO	85	457,960
WA	KE7C	85	57,405
DX Stations—Single Operator:			
Balearic	EA6VQ	85	23,790
Bermuda	VP9KA	85	71,530
Bulgaria	LZ1KOZ	85	18,900
Chile	CE4ETZ	86	11,400
Czech.	OK1RI	86	441,600
England	G4XOM	86	15,640
Honduras	HR1FC	85	11,160
Indonesia	YC0SY	86	5,360
Israel	4X6IF	86	16,170
Italy	IK2GSN	86	38,130
Japan	JP1GLV	86	26,640
Korea	HL1ABR	86	2,500
New Caledonia	FK8FA	86	21,700
Nigeria	JG1FVZ/5N0	86	223,720
Philippines	WA7COE/DV2	86	80,460
Portugal	CT1TM	85	4,900
So. Africa	N4NW/ZS	85	38,675
Spain	EA3BOX	86	89,440
UN HQ	4U1UN	85	13,225
Virgin Is.	N4CIS/KP2	86	54,120
DX Stations—Multi-Operator:			
Hawaii	KH6DW	86	333,575
Japan	JA3YBF	85	23,205

Table 4. 15-meter honor roll—all-time record holders. (Columns show QTH, callsign, year, and score.)

WD5GSL (40), VE3BVD (39), and KH6DW (34). Believe me, it was tough!

DX multipliers were just as scarce. While many DX stations were on, old Sol just would not allow signals to take more than a couple hops. Stations fortunate to work 30 or more DX countries included: KM5X (67), OK1RI (65), K5LZO (59), NR5M (56), JG1FV/5N0 (46), VE3BVD (44), WD5GSL (38), KS9O (36), and KC2EE (33).

We have taken a survey of the various antennas used during the 15-meter contest and calculated the percentages. Here are the results:

3-element triband yagi	18.0
4-element triband yagi	10.3
4-element monoband yagi	10.3
Trapped vertical	8.6
Inverted vee, dipole	6.8
Vertical	6.8
6-element triband yagi	5.1
7-element monoband yagi	5.1
G4ZV/G5RV	5.1
Longwire	3.4
3-element monoband yagi	3.4
5-element monoband yagi	3.4
6-element monoband yagi	3.4
4-element monoband quad	3.4
3-element monoband quad	1.7
6-element monoband quad	1.7
2-phase rotatable helical verticals	1.7
13-element log periodic	1.7

If the contest scores don't have you envious of the winning stations, then perhaps the equipment survey in Table 3 will get your mouth to watering.

To many, the contest meant adding a new country to their DX country totals or their Worked All Zones. To others it meant their 50th state for WAS. We saw a few contest records broken and some new records established. Refer to Table 4, the honor roll list of all-time record holders.

On behalf of contest chairman Gary Vest NW5E, we thank each of you who took the time to get on the air during adverse band conditions. Without you, the contest would not have taken place. We appreciate your dedication and promise you it will pay off when the sun spot cycle does a 180-degree turnaround. You are certainly the deserving few who know what contesting is all about. ■

15-METER SOAPBOX

4X6IF	Band conditions were superb here! Family commitments allowed me to operate only a few hours, though. See you next year.
JA1AAT	Conditions no good, only Asia and Oceania stations heard.
JL1MWI	No good conditions in Japan!
JR5HCU	It was a great pity that I could not contact with any U.S. stations. Band no good today.
KC2EE	I really enjoyed the contest.
KJ4LU	Thanks for FB contests. Played around on 15 just to get ready for the 20-meter contest. Almost did better on 15 than I did on 20, though. Heard no stateside on 15 in a two-hour period. Band was pretty bad.
KD5RW	Good conditions. Had rig trouble and overheating amp.
KM5X	Thanks for Europe, it was fun!
NF2C	Conditions poor. Very few openings anywhere. Thanks for the test and see you next time.
NJ7A	With random wire and running barefoot . . . if you can't hear them, you can't work them; if you can't work them, they can't work you!
OK1RI	Difficult to get contest results here!
W4WKQ	I enjoyed the short 15-meter opening. Wish conditions had been better, though.
W5IYX	The low solar flux is still hurting the contest. Just a bare European opening at times. In a few more years this should be a very good event. [Roger that!—KE7C]
WA7CQE/DV2	First time for this contest. I really enjoyed it. Wish more would play but still appears to be picking up since last year's contest. Thanks. *73!*

1986 15-METER WORLD SSB CHAMPIONSHIP

Callsign, QTH, QSOs, states and provinces, DX countries, total score

** = World Champions; * = State, Province, Country Champions

Callsign	QTH	QSOs	States and provinces	DX countries	Total score
W/VE—Single Operator:					
** KM5X	TX	548	49	67	458,780
* NR5M	TX	540	50	56	378,950
* VE3BVD	ONT	404	39	44	225,640
* KS9O	IL	264	31	36	136,680
KC2EE	TX	254	44	33	122,815
W5PWG	TX	181	33	23	56,560
* K7QO	WA	157	33	16	48,755
* W4WKQ	FL	157	25	20	40,500
* WA6FGV	CA	140	18	9	20,250
K6XO	CA	75	16	15	14,415
KJ4LU	NC	74	0	19	14,060
KV0I	NE	55	16	14	10,800
WK4F	FL	39	11	19	8,700
K3ZO	MD	31	5	13	4,590
WD8DVX	OH	28	9	9	3,870
W3SOH	VT	33	7	12	3,800
K4GKV	GA	22	5	12	3,145
W3ARK	PA	27	1	11	3,120
N5AFV	TX	27	8	10	3,060
KX2J	NY	26	11	7	3,060
WA5IYX	TX	31	9	7	3,040
W0IZV	CO	21	9	8	2,635
W5EIJ	AR	13	2	7	720
W9REC	IL	12	4	4	680
NJ7A	UT	13	4	4	640
NF2C	NJ	11	3	2	275
W0NGB	MN	5	0	4	200
VE8RCS	NWT	7	0	4	140
DX—Single Operator:					
** OK1RI	Czechoslovakia	518	31	65	441,600
* JG1FVZ/5N0	Nigeria	333	22	46	223,720
* EA3BOX	Spain	187	32	20	89,440
* WA7CQE/DV2	Philippines	461	0	18	80,460
EA7AVU	Spain	167	32	16	68,460
* N4CIS/KP2	Virgin Is	237	34	10	54,120
* IK2GSN	Italy	103	24	17	38,130
* JP1GLV	Japan	163	2	22	26,640
* FK8FA	New Caledonia	226	4	6	21,700
I4CSP	Italy	56	20	15	17,675
EA5FCP	Spain	78	22	1	16,200
4X6IF	Israel	94	1	20	16,170
G4XOM	England	57	14	20	15,640
CE4ETZ	Chile	57	19	1	11,400
JL1MWI	Japan	101	1	16	10,890
OK1TW	Czechoslovakia	41	11	16	9,620
JR5HCU	Japan	114	0	13	9,230
4X4FL	Israel	40	12	22	9,120
YC0SY	Indonesia	37	0	16	5,360
JA2BNN	Japan	63	0	11	4,235
EA3CHI	Spain	29	0	14	2,800
JE7HFQ	Japan	34	0	11	2,585
HL1ABR	Korea	43	0	9	2,520
OK1KZ	Czechoslovakia	22	5	8	2,275
EA5EFV	Spain	17	9	5	2,100
CT1DIZ	Portugal	17	1	12	1,495
OK2BHQ	Czechoslovakia	9	4	4	680
JH3DEJ	Japan	8	0	5	400
JE1TTO	Japan	6	0	4	180
CT1AHC	Portugal	3	2	1	90
JA1AAT	Japan	6	0	2	90
JM3XHD	Japan	3	0	2	40
JO1MCC	Japan	2	0	2	40
W/VE—Multi-Operator:					
** K5LZO	TX	521	48	59	384,665
* KD5RW	LA	298	42	28	134,050
* WD5GSL	TX	228	40	38	114,270
DX—Multi-Operator:					
** KH6DW	Hawaii	618	34	21	333,575
* JA2YEF	Japan	131	1	18	15,865
JA9YBA	Japan	102	0	10	6,150
JA2YDC	Japan	2	0	2	30

(Checklogs—By request: EA3CTI, EA3PE, KJ4NC, OZ1DPW, VO1OP; checklogs—Late entries: 4Z4TR, AH6EK, DL6FBL, JA1YAG, JA7YCO, K5GN, OH7EU.)

Multi-Operator Participants:

JA2YDC	Aichi Institute of Technology, JE2EZO, JI2RIG
JA2YEF	Chuba University Radio Club, JF2NFC, JF2QHC, JI2LPD, JI2OVF, JJ2VAI, JJ2VFE, T. Yamamoto
JA9YBA	Kanazawa University ARC, JA9LNJ, JA9VDA, Kony Hirosh, Mia Takasi
K5LZO	K5LZO, KE5IV, NM5M, NT5D
KD5RW	KD5RW, KA5DLM, KA5BOO
KH6DW	KH6DW, K7SS
WD5GSL	E-Systems ARC, WB0TEV, WD5ABC, WF5C, KA5YDC, KA5YFI, KA5WHY

NEVER SAY DIE

from page 14

WA6ITF presenting the Westlink Young Ham of the Year award to Shawn Wakefield WK5P. We'll have more in *73* about the winner, so I won't go over that here. But anyone who still thinks we're losing youngsters because they have too many other interests attracting them—instead of admitting that our blind insistence on Morse code is killing amateur radio—needs to see what this chap has been doing.

I think it was Roy who brought up the simile of old men in a lifeboat stamping on the fingers of those trying to get in. Apt.

There is one aspect of Las Vegas that I do enjoy—the buffets. My, oh my, they've developed those into an art form. Back in the Saroc days I remember one hotel with a buffet; now they're from one end of the strip to the other—and downtown, too. The lunch prices run from $2.50 to around $4 and some are great. Of course, I suppose I'd class any buffet which ends up with an ice cream machine and buckets of sundae toppings as great. Who needs the buffet?

One of the locals cued me into an Italian buffet in the shopping mall on the strip. Unfortunately I didn't quite get that far, being stopped by the Oasis Hotel buffet. No complaints. Maybe next time I'll make it.

The Imax theater in Caesar's Palace was closed for another week. I hate to miss an Imax—spectacular shows.

Get your priorities straight and plan to get to Ham/West next November. The weather will probably be beautiful—around 80 degrees again, while snow and bitter cold hit much of the rest of the country. The show is well managed—the ham dealers are there with good prices—the flea market will load you down with stuff you can't afford not to buy—and Vegas is there to entertain you—make you fat—and suck you dry.■

PROPAGATION

Number 23 on your Feedback card

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA	20	40	40	40	80	80				20	15	15
AUSTRALIA	20		20		40	40	20	20			15[1]	15[1]
CANAL ZONE	15	20	20	40	40		20	20	15	15	15*	15*
ENGLAND	20	40	80	40	40		20	20	20	20	20	20
HAWAII	20		20		40	40	80	20			15[1]	15[1]
INDIA	[illegible]					20[1]	40[1]	20[1]				15[1]
JAPAN	20						20	20				20
MEXICO	15	20	20	40	40		20	20	15	15	15*	15*
PHILIPPINES							20					
PUERTO RICO	15	20	20	40	40		20	20	15	15	15*	15*
SOUTH AFRICA			40[1]	40[1]				15	15	15	20	20
U.S.S.R.	40	80	80	40			20	20	20			40
WEST COAST		80	80	40	40	40	20	20	20			

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA						80*	40*	20				
ARGENTINA	20		40	40	40						15	15
AUSTRALIA	15					40	20	20	20			15
CANAL ZONE	20	80	40	40	40	40	20	20	15	15	15	20
ENGLAND	40	40	40	80				20	15	20		40
HAWAII	15	20			40	40	40				15	15
INDIA	15[1]	20[1]	20[1]				40[1]	20[1]	20[1]			
JAPAN						80*	40*	20				
MEXICO	20	80	40	40	40	40	20	20	15	15	15	20
PHILIPPINES								20				
PUERTO RICO	20	80	40	40	40	40	20	20	15	15	15	20
SOUTH AFRICA	20	40*							15	15	20	20
U.S.S.R.	40		40	40				20	20			

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20			40	40	40	40	40			20
ARGENTINA	15	20		40	40	40	40	40		15	15	15
AUSTRALIA	15	20	20				40	80*	40	15	15	15
CANAL ZONE	20	20		40	40	40			20	15	15	15
ENGLAND			80*	40					20	20		
HAWAII	15	15			20	20	20	20				15
INDIA		20										
JAPAN	15	20			40	40	40	40	40			20
MEXICO	20	20		40	40	40			20	15	15	15
PHILIPPINES	15	20					40	40		20		20
PUERTO RICO	20	20		40	40	40			20	15	15	15
SOUTH AFRICA	20	40[1]	40[1]							15	15	20
U.S.S.R.		40[1]	40[1]	40[1]	40[1]				20	20		
EAST COAST		80	80	40	40	40	20	20	20			

1 = May be open only once or twice during month.
*** = Try next higher band.**

G = Good, F = Fair, P = Poor.

The period of the 14th through the 17th is especially disturbed due to magnetic storm conditions.

FEBRUARY

SUN	MON	TUE	WED	THU	FRI	SAT
1 F	2 F–G	3 G	4 G	5 G	6 G	7 G–F
8 F	9 F–G	10 G	11 G	12 G–F	13 F	14 P
15 P	16 P	17 P–F	18 F–G	19 G	20 G	21 G–F
22 F–P	23 P	24 P–F	25 F–G	26 G–F	27 F	28 F

MARCH 1987
Issue #318

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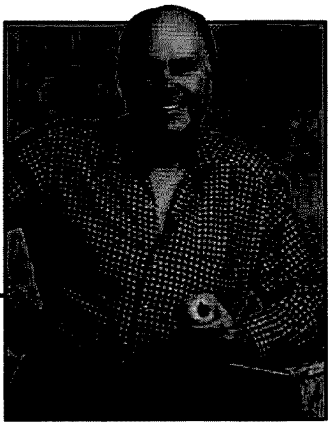
Departments

NEVER SAY DIE

Number 20 on your Feedback card



73 SOLD?

Henny-Penny called from California in a great dither. It seems that Dick Bash had bought *73* for $26 million and was moving it to California. Wow! I got so excited I started looking for a carton to empty my desk—well, a very small carton since I use a table for a desk so I can't lose things in my desk drawers.

Then a few niggling questions began to arise. Like where would Bash dig up $26 million? Or $26 thousand, for that matter? And how come I hadn't heard anything about all this, since I'm the only person who could make such a deal?

Let's see now, could Bash have conned twenty-six California millionaire hams into ponying up a megabuck each with a promise to award them the first twenty-six of the new *73* DX Dynasty Awards? That made as much sense as anything else. Or was this just another rumor invented by Brand X magazine to confuse the weak-minded? I had to admit that $26 million would come in handy—there's always a use for a little extra cash—even though $26 million doesn't go as far as it used to.

Brand X has been so busy that I've been thinking of starting a rumor-of-the-month award to send them, complete with a handsome certificate. Such creativeness should not go unrewarded.

Perhaps, just to keep things lively and contribute to the confusion, I should send a note to the other ham magazines, offering to buy them for, say, $10,000 each. Then I could get Henny-Penny to let the world know that I'm "dickering" to buy them.

On second thought, I don't need the aggravation, so to heck with it.

Speaking of Bash—Dick seems to have disappeared since the VEC program shot his scam down. Dick sure milked the hobby for all it was worth for a few years, changing the whole fabric of amateur radio by making it no longer necessary to have even the slightest technical understanding of radio to get a ticket. Heck, one little nine-year-old girl got her Extra-class ticket using his system! If Dick saved some cream off that milk he should be sitting back fat and happy.

One of the reasons I've had difficulty getting exercised over easy entry into amateur radio has been the pervasive cheating down through the years. Early on, thousands got their tickets by paying hams to take the FCC exams for them. Others found it cheaper to come in through the Class C gate—bribing a ham in the hinterlands to pass them, then "moving" from their fictional Class C address to their real address. Heck, the publisher of a ham magazine I could mention went this route.

How many Techs were given their tickets by friends? I even had one managing editor of *73* who came into the hobby this way. He was given his license without the faintest knowledge of code or theory. He got interested as a result and became a technical expert. He never did get far with the code.

Tens of thousands of phony Techs came into the hobby in the 60s. Most of them settled on two meters and many are still there. I remember one who made a good deal of money setting up repeaters and then selling them to the user groups which sprang up around them. Great technician, but as far as I know he still doesn't recognize his call on CW.

Now we're hearing stories of volunteer examiners selling licenses wholesale. Will this, as so many hams firmly believe, result in amateur radio becoming just another citizens band? That's a knee-jerk reaction—one I doubt

Continued on page 10

"I'm the guy you were talking to on two meters! Please follow me to our yacht landing for dinner!"

QRM

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Subscription Information

Rates: in the United States and Possessions: One Year (12 issues) $24.97; Two Years (24 issues) $45.47. Elsewhere: Canada and Mexico—$39.00/1 year only, US funds. Foreign surface mail—$45.00/1 year only, US funds drawn on US bank. Foreign air mail—please inquire. To subscribe, renew or change an address: Write to Subscription Department, PO Box 931, Farmingdale NY 11737. Return postage guaranteed. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients. For questions concerning your subscription and to place subscription orders, please call us toll free at 1-800-227-1053 (in NY 1-800-732-9119) between 9 am and 4:30 pm Eastern time or write to *73*, Subscription Department, PO Box 931, Farmingdale NY 11737. ***73 Amateur Radio*** (ISSN 0745-080X) is published monthly by WGE Publishing, WGE Center, Peterborough NH 03458-1194. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Canadian second class mail registration number 9566. Microfilm Edition—University Microfilm, Ann Arbor MI 48106. **Postmaster:** Send address changes to *73 Amateur Radio*, Subscription Services, PO Box 931, Farmingdale NY 11737. Nationally distributed by International Circulation Distributors. **Contract:** Too bad—merely reading this is a binding contract between you and the publisher. To get more pages for *73*, more advertising is necessary. To get more advertising, more readers are needed. You hereby agree to be an official *73* subscription agent. You will tell every ham you contact that you read about him in *73* this month so he'll rush out to buy a copy. It's just a little Green lie, so stop sweating. It'll work. He'll frantically read every word in the magazine, discovering its magnificence in the process. Look, if reason doesn't work we'll have to use subterfuge.

$300 Ticket

IF YOU'RE HAVING TROUBLE getting that upgrade, think about a trip down to New York City. Word on the streets there is that licenses are currently going for $300. There's even a discount plan—if you bring in three other applicants, you get a free Advanced-class ticket. Bring in four people and you can walk away with that Extra-class ticket you've always wanted. We've been receiving lists of hams who allegedly purchased a ticket through this system (about 40 so far), and most of the new licenses seem to be General-class. I guess they're having trouble rounding up enough cheaters to get the discount.

Feet Feat

HARTLEY ALLEY NA0A has found a unique way to show off at his high school reunion. Hartley will be riding his bicycle from Boulder, Colorado, to Lynn, Massachusetts, taking two months to get to his 50th high school reunion. Alley's journey will take him through Colorado, Nebraska, Iowa, Illinois, Indiana, Ohio, Pennsylvania, New York, and Massachusetts. Along the way he'll be on the air mobile from his bicycle on two meters, using a speaker microphone and a half-wave rack-mount antenna. Hartley recently sold his bike shop in Boulder and claims that he's become quite bored in retirement. Hartley credits cycling for saving his life; he suffered what is called a "silent" heart attack during his years at the bike shop, not even realizing that it had occurred. His physician says that Hartley's constant cycling (about 100 miles per week) helped minimize the attack's damage. Hartley will be leaving for Lynn in May and expects to arrive there in late June; look for him signing bicycle mobile.

Hubble Help

YOU CAN BREATHE a sigh of relief if you just realized that you missed the deadline for the Hubble Space Telescope project. The launch date for the telescope has been shifted to the latter part of 1988; the new deadline for applications is June 30, 1987. The Hubble Space Telescope Amateur Astronomers Working Group is making time available on the orbiting platform for amateur astronomers. To apply, send $1 to HST Amateur Astronomers Working Group, c/o AAVSO, 25 Birch Street, Cambridge MA 02138.

Florida Info

THE HERNANDO COUNTY Amateur Radio Association of Brooksville, Florida, has come up with a nice idea. They've printed up information pamphlets covering ham radio in the state of Florida and have placed them in the state's welcome centers. The pamphlets list all of Florida's two-meter repeaters and traffic nets. You can get a copy by sending an SASE to the Hernando County ARA, PO Box 1721, Brooksville FL 33512.

Cable Cops

A REALLY SERIOUS PROBLEM is developing around the cable television industry in Israel. Even though the Israeli government has enacted legislation to license and regulate CTV stations, there are about 500 illegal systems in operation around the country, most of them using a home video setup hooked up to an amplifier and cheap coax running from building to building. Occasionally the Ministry of Communications sends commandos out to raid these pirate stations. A few months ago, such a raid in Kiryat Kotzkin resulted in the destruction of **Tzvi Pomer 4X4KT's** wire antennas. Tzvi complained to the Ministry and discovered that the raid had been carried out by operatives from the Federation of Film Distributors. Even though the Federation wouldn't admit to the action, they paid Tzvi what he claims is a fair compensation for his wrecked antennas. In Haifa, hams are afraid to be on the air since their signals interfere with the poorly engineered pirate systems; the hams fear retribution from what they term "shady underworld types."

Hartley Alley NA0A will ride from Boulder, Colorado, to Lynn, Massachusetts, for his 50th high school reunion.

Cat Caper

HAM RADIO figured prominently in the rescue of a man and his cat from their sinking boat in the waters near Miami recently. Timothy Stein noticed a foot of water in the cabin but couldn't find a leak; after the rising flood knocked out the boat's two-way radio, Tim turned to his ham set. **Fred Barfus** of Coral Gables picked up the distress call and relayed the message to the Coast Guard. Thirty minutes later, Stein and his cat Gray were pulled from the water by the *USS Aquila*. The rescuers reported that Stein was in great shape but Gray was a bit frazzled.

WAO Award

JUST IN CASE you've worked all of the counties in the United States, **Alan Harnois VE3LFH** has come up with the **Worked All Ontario** award. The certificate can be yours for working the 50 counties of Ontario (including our favorite, Peterborough County): You must have QSLs in your possession, but you don't have to send them in with your application. There is no certificate for SWLs. A map of the province is available from the provincial government; write to the Map Unit, East Building, 1201 Wilson Avenue, Downesview, Ontario M3M 1J8, or call (416)-248-3476 and ask for the Index Map of Southern Ontario. The WAO certificate is $2—send your list of counties worked to Alan at 400 Lafferty Street, LaSalle, Ontario N9J 1K6.

VEs Canned

FOUR ARRL Volunteer Examiners have been stripped of their duties after irregularities in testing sessions came to the League's attention. Fifty applicants have had their exams voided and their certificates of completion recalled due to the screw-up. Copies of the paperwork involved in the case have been sent to the FCC for review.

OSCAR's Up!

HERE WE GO AGAIN: OSCAR 10 is once more usable for communication. Even though the spacecraft can no longer be controlled from the ground, the mode B transponder has been stuck on and is providing excellent coverage. AMSAT engineers are optimistic that OSCAR 10 may survive for a while due to improved sun angles and the diminished possibility of long eclipses that would drain the craft's batteries. Writing in the *Amateur Satellite Report*, Editor Rip Riportella advises folks to get on and enjoy OSCAR operation while they can, and points out that new DX opportunities are arising every day. Be *very careful* to use low power (100 Watts erp maximum) to help extend the satellite's life.

Brando

REMEMBER ABOUT A YEAR AGO when we reported that Marlon Brando was living in Polynesia and using the alias Martin Brandeaux? Well, the press has gotten wind of the story and has completely botched the information. I shouldn't poke fun at another journalist, but this is so typical of the sort of reporting about ham radio that appears in nearly every paper in the country. WA6RBU sent this clipping in from Beverly Hills, and it contains gems like: "The actor uses a secret alias . . . and talks to ham operators around the globe—and they don't even have a clue who it is because the radio alters his voice!" and "Any shortwave operator who wants to call Brando should point his antenna 241 degrees clockwise due north from the east coast of the United States and about 209 degrees from the west coast." With press like that, we might as well all be on CB!

Thanks

OUR THANKS TO WA4BPI, WA6RBU, *Amateur Satellite Report, The ARRL Letter,* and W5VC for help with this month's column. Send your news and pictures to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: QRX.

Paper Call

THE SIXTH ARRL Amateur Radio Computer Networking Conference is scheduled for August 29, 1987, in Redondo Beach, California. Hosted this year by the TRW Amateur Radio Club, the conference will feature papers presented by the leaders in packet technology. If you are interested in presenting a paper, you should contact Maty Weinberg at ARRL Headquarters, 225 Main Street, Newington CT 06111; (203)-666-1541 for an author's kit. Camera-ready originals are due at the League no later than July 27, 1987. Subjects being sought include transmission technology, networking and network expansion, applications, operations, message handling, international concerns, spectrum management, and the integration of voice, data, and images.

The "ham bands" now have a whole new meaning. "Shady Hill" from Jonesboro, Arkansas, is comprised of (l-r) Bill Shoe KB5ABI, Rick Lane KB5ADI, Carrol Lane, Tom Meridith K5MEA, and Norma Meridith WB5NZN.

NEVER SAY DIE

from page 4

anyone has actually given any serious thought to.

If amateur radio had only forty channels instead of thousands, what might it be like? All we have to do is listen to the unholy mess in New York and Los Angeles on two meters to get a hint. I've monitored CB all over the country and I've never heard anything worse than two meters in L.A. Pardon me for getting the impression that putting down CB is a redneck reaction.

Ask me what entry system for amateur radio would work better than what we're doing now—or have done in the past. I've thought a good deal about this—have you? I'd like to see some ideas published in our ham magazines which would aim us at improving the entry—perhaps in a way which might help us get the hobby growing again. I'd like to see a system which would bring in a growing number of hams. Then it should present them with opportunities and incentives to grow.

The basic reasons for our hobby being licensed by the government are four—as stated in our rules. (1) To provide a resource of technically trained people in case of war. (2) To provide emergency communications. (3) To foster international goodwill. (4) To provide a medium for inventing and developing new communications technology.

There is an international requirement for understanding the code, but it is so weak that many countries have completely ignored it. Indeed, most of the two million ham licenses issued in Japan are no-code tickets.

Okay, the code . . . let's start at the beginning here. If we continue to have a first license which offers only CW allocations, we can stop bothering to give code tests. No one can operate on a Novice band on phone, so every Novice HAS to know the code to operate.

On that basis I would suggest ending any code tests. Instead I would make it so only established radio clubs could have VEC teams—that clubs be responsible for training newcomers in rules, theory, and operating—then have three licensed ham members examine the applicants. Once they get their Novice ticket they would have to show QSL card proof of actual operating—plus an additional exam on rules, theory, and operating—to get their General license. I'd do away with the Tech license as redundant.

Some will drop CW as soon as possible. Others will find they enjoy it and build their code skill. Once code is no longer a government mandated skill, I'll offer code proficiency certificates which can be won at hamfests and conventions and which will be prized proof of a unique ham skill.

In this day of sealed rigs (where the warranty is voided if you even try to fix a problem), it's difficult to get many amateurs to bother keeping up with technology. By encouraging amateurs to start building simple construction projects and graduating them to state-of-the-art computer and communications technology, I believe we can make technology exciting—fun.

It's interesting that what few youngsters we're attracting to the hobby these days do not seem to find today's technology any more intimidating than we old-timers did tubes fifty years ago. They're as familiar with ICs and UARTs as we were with modulated oscillators. A few old dogs have learned new tricks, but most are holed up, quickly thumbing past solid-state articles in the ham magazines, bewildered—too lazy to even try to cope with progress.

So, yes, I agree, if we open amateur radio completely—take all comers without any restrictions and dump 'em on the air—the result will probably be bigger pileups on two-meter repeater channels. We'd probably see the Los Angeles mess spreading to more major cities.

But, as it has in Japan, once congestion gets serious it would tend to push us to use more bands. Japan is going strong on 450 MHz and now moving to fill 1250 MHz—with many moving to even higher bands. Their 10-Watt limit on the lower bands has worked very well—allowing their equipment manufacturers to dominate the entire world—bringing hundreds of millions of dollars to Japan.

If we're still too proud to take a lesson from the Japanese, we deserve everything that's happening to us—in ham radio—lasers—cars—cameras—scientific instruments—telephone switching—hi-fi—cassette recorders—watches—computers—VCRs—video cameras—TV and so on.

Does the future of American technology lie in our ability to get amateur radio interesting to youngsters again? We know for sure that if we want to develop engineers we have to start 'em around 12 years old. How else but amateur radio? We also know the system we're using now isn't working—and the one Japan uses works fantastically.

So let's start discussing ideas—on the air and in letters to your ham magazines. We need ideas, not knee-jerk, redneck resistance to change. We want to not only keep our bands, we want to move ahead with new technologies—perhaps setting up world commu-

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0745-080X) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

nications systems via our own or even commercial satellites.

If we can start attracting youngsters again and if we provide the excitement and interest they need, we'll see them developing and pioneering new communications technologies, just as hams did until the Licensing Incentive Disaster of 1963 stopped everything.

We old-timers are still living on the glory of the long past—our development and pioneering of single sideband—our early RTTY developments—slow-scan television—narrowband FM—the parametric amplifier—the flying noise lock—double sideband reduced carrier—and so on.

Old-timers will remember amateur moonbounce work and meteor-scatter communications. Do you know that in the 60s Ray VK3ATN in Australia was making regular two-meter moonbounce contacts with U.S. amateurs with a huge rhombic antenna? I visited his station in 1966 and took pictures of his antenna farm from the air—amazing.

Now, with a marriage of computer and communications technology, we have more potential new modes of communication possible than ever before—we just lack the youngsters to experiment and pioneer them. Alas, without amateur radio as a source of such developments, they are unlikely to happen.

You see, even if we had plenty of engineers, we'd find commercial firms resistant to investing development funds in projects with much less than a 100% potential for bringing in a viable product. Big firms just don't like to take any chances, so they make sure the products their scientists and engineers are working on are sure-fire.

Unfortunately, really new technologies often are far from sure things. An amateur can afford to spend months to years designing something new. If he succeeds, fine, he has a chance at making money. If he fails, well that's the way it goes. The commercial scientist who fails soon becomes not just out of work, but unemployable.

If you think about it, most of the major breakthrough inventions have been made by amateurs—so we need amateurs if we are going to make any large strides in technology. The lack of youngsters in amateur radio over the last 23 years has stopped this valuable contribution to our country.

I'll tell you what. If you help me get amateur radio growing again, with lots of youngsters coming in—and if I manage to find an enthusiastic replacement for me to write editorials for *73*—then I might consider offers to buy the magazine. I'm 65 this year, which not long ago was the mandatory retirement age, so I worry about such things. In the meanwhile Bash can keep his $26 million.

A VISIT TO THE RSGB

My wife Sherry dropped a brochure from the Show of the Month on my desk a couple months ago. Amidst the listings of shows in Boston was a notice of a Thanksgiving trip to London. Hmmm. It left Thanksgiving eve and returned on Sunday, allowing three days in London, so not even a day of work would be missed. The price was $499—including round trip airfare, a first-class hotel (Hilton), breakfasts, and two London shows. How could I pass it up?

How could I visit London and not pay the RSGB a visit, right? Stu Norwood, *73*'s Associate Publisher, went on the trip, too, so he called them and arranged for my visit. The minimal instructions which filtered down to me were enough so I was able to muddle through and arrive on time.

I was fortunate that they had scheduled my visit for 11 a.m. instead of 10, as I'd asked. They're located quite a way out of London, so it took much longer than I expected to get there... about two hours. The taxi driver at the railroad station wasn't familiar with the RSGB, but he did know the road, so we found the building with no difficulty. I was surprised, knowing how well trained London cab drivers have to be to get licensed. Perhaps it's easier in small towns such as Potter's Bar.

I was supposed to visit a Mr. Rider, but apparently he was tied up. After a half-hour wait in the lobby, I was greeted by Dave Gough G6EFQ, who quickly showed me the headquarters station, the antennas on the roof, gave me a QSL card and shortcut directions to walk back to the railroad station. I guess everyone else was busy. It was a fine, brisk winter day, so the twenty-minute walk back to the station was invigorating.

Dave explained that unlike the ARRL, which has always been operated by paid operators, the RSGB depends on staffers with the spare time to keep the shack in shape and on the air. They've got a nice tribander, but a VHF antenna mast going up through it keeps it from turning. Most of the action these days is on VHF anyway. Perhaps when the sunspots bring more action to the lower bands they'll free up the beam.

On the way back to London, I suddenly realized I'd gotten so excited over seeing the RSGB HQ station I'd completely forgotten to buy the latest issue of their magazine.

The two shows were fun and visiting compact disc stores for my *Digital Audio* was a blast. It was a great, if short, London trip. Maybe, if they have another show tour to London next Thanksgiving, you can join me and go out to see the RSGB headquarters station and get your own QSL card.

"$26 million doesn't go as far as it used to."

USSR SCREWED UP TOO

The amateur radio situation in the USSR seems just as bad as ours—worse, considering their population as compared to ours. It's nice to see another major country being as dumb as the U.S. about something so important to its future.

There's no reason to expect the laws of nature to be all that different in the USSR—you get your best engineers and technicians via teenagers who get involved in electronic hobbies such as amateur radio and computer hacking. Thus the dying of amateur radio in Russia will have the same end effect it's having here—a loss of technology. Only Russia is in the even more serious position of further losing in its efforts to catch up with the West, since it's always been behind in technology. It couldn't happen to a nicer administration, right?

The more we encourage communist countries to fear amateur radio, the better our chances for seeing them just die away as the rest of the world sails past them in technology. So let's make sure they understand that amateur radio means people-to-people communications. The more we can get the Russian hams—what few there are of them—to talk with us and get off their boring signal report/QSL card shtick, the better.

Let's get after these turkeys and get them to behave like live people instead of tyranized slaves. Ask them to tell you about their work—about their town—flatly refuse to give them a signal report until they talk with you. Ask them how their weather has been. Heh, heh... ask about their crops—probably a state secret.

There are still around 5,000 collective ham stations—club groups. These are about all we'll hear—the other 5,000 or so Russian hams are mostly on VHF where they can't get into trouble talking with foreigners. This keeps down the number of monitoring stations it takes to check on 'em.

Like the U.S., Russia has let most of their school radio clubs die. Today there are only about ten active school ham stations in Moscow out of 1,200 schools, according to the *W5YI Report*.

You might want to keep an eye on *Newsweek* for any Russian news of interest which you can bring up while you're in QSO with Russian hams. I'm sure they will be delighted in your interest in their country—in discussing the latest news of persecuted dissidents—in the problems Jews who want to leave are having—building that gas pipeline to Europe with slave labor—the deadening effect on their lives of the ubiquitous lines for food and clothes—the housing shortage—everyday things like that.

Of course you should be prepared to frankly answer questions about the legions of homeless, jobless, starving Americans desperately wandering the streets of our cities and the hopeless plight of our persecuted blacks and Hispanics.

Yep. One of the basic reasons amateur radio has some of the most valuable shortwave frequencies allocated to it is for establishing people-to-people communications between countries—international friendships. Now let's be honest about this—have you been living up to your responsibility according to our rules and regulations? And, no, swapping a signal report and QSL does not even

Continued on page 62

LETTERS

Number 18 on your Feedback card

IC-751A REVIEW REPLY

1. The IC-751A is built on IC-751 technology and is not similar in circuitry to IC-735. IC-751A main board is redesigned.

2. The IC-751A uses blue/red *fluorescent* display. (IC-701 had LED display.)

3. A) IC-751A uses the same CPU as the IC-751.

B) Program storage is identical in IC-751/751A.

C) See ICOM Talk "One Step Beyond." ICOM radios *do not* go dead in five years, requiring return to factory for reprogramming.

D) Only IC-745/751/751A/R71/271/471/1271 have exchangeable RAM card.

4. IC-735 *does* have a heat sink. It has a large, built-in heat sink with a squirrel cage style fan. IC-735 and IC-751/751A have similar temperature/fan speed characteristics.

5. IC-751 does not have thermal drift problem. Extra sensor is provided to improve component life where *internal* power supply is installed and radio is operated for extended periods of time in receive.

6. High noise blanker settings *do not* cause distortion of CW signals. Noise blanker operation requires proper settings where distortion may be caused by particular band conditions with noise blanker use.

David Smith
ICOM America

DX DYNASTY—NO!

Was excited about award until saw "QSL cards are not required for the DXD Award." Totally ruins award's value—No thanks, I'll stick with DXCC.

Ken Kopp K0PP
Anaconda MT

The idea behind DXDA is to give people a chance to have some fun working DX again. We want to get your heart thumping when you hear an almost-rare prefix—even if you've worked that country dozens of times in years past. How much fun can you have if you're working only one or two new ones a year?

We're not naive, Ken. There are slimeballs out there who will abuse the "no QSLs" rule, but that hardly affects the award's "value." We're not trying to be like DXCC, we're trying to offer an alternative to it.

The DXDA's "value" is $6, plus whatever pride the person who earned it takes in the accomplishment. If you earn it fair and square, it's worth something to see that piece of paper reminding you of the work and the fun you had getting it. If you somehow manage to fake your way to DXDA, please remember that we just sold you a piece of paper for $6.—KA1MPL

NEW HAM IN CHINA

I'm a new ham and my name is Chang-Han Dong. There are only 15 amateur stations in China, two of them in Shanghai, they are BY4AA and BY4AOM.

You know that the equipment of communication is very expensive, so I want to make a receiver (amateur band, SSB, CW, etc.) to use. Some time I knew of two articles in your magazine but I have not any way to look for your magazine In Shanghai, so I haven't the whole articles.

I think, you may help me... Thank you very much. I hope to see you on the air. 73!

Chang-Han Dong
Shanghai
People's Republic of China

Welcome to the hobby, Chang-Han Dong! The articles are on their way to you and we hope they will help. Perhaps your letter will inspire some of our readers to write you with encouragement. (The address: Institute of Estuarine & Coastal Research, East China Normal University, Shanghai, The People's Republic of China.) For more on China, see under Roundup in 73 International in this and last month's issue.—Eds.

DX DYNASTY—YES!

Your new DX Dynasty is a good idea. May I suggest you not only continue this but that you consider starting an annual version. Being a free enterprise magazine rather than a League-affiliated one, you are in a position to defer your expenses by charging a filing fee for a yearly contest. Why not a separate DX contest for Novices ONLY? You have unlocked a plethora of interesting ideas.

H. Wayne White KB5NO
Hereford TX

DX DYNASTY—YES, YES!

I am glad to see someone finally do something constructive regarding DX-100. I just qualified for ARRL DXCC and it cost me a fortune to get the QSL cards. The Bureau is only 80% useful under ideal conditions. Now I can start anew in 1987 and have the fun of earning DXDA without all the hassle of trying to get cards.

Carole Perregaux KA1FVY
Trumbull CT

RUSSIANS AND BEARCATS

Thank you for publishing Bill Pasternak's and Robert Horvitz's commentary on the Electronic Communications Privacy Act [*73*, Looking West, January, 1987]. As a ham and SWL, it is ludicrous for anyone to assume that it is possible to place restrictions on what may and may not be listened to on a multiband scanning-type radio. Talk about eavesdropping—ever go down Embassy Row in Washington, DC? Check out those strange antennas on top of the Soviet and Soviet-block embassies. They certainly don't care about the ECPA, and I am sure they are not using them to chase DX on 20, either! I feel that our tax dollars would have been better spent on going after the KGB operating out of the United Nations rather than the American public using their Bearcat scanners in the privacy of their own homes.

George Primavera WA2RCB
Cherry Hill NJ

PERPETUAL MOTION

I just want to tell you how important the article by Irving Gottlieb happens to be ["No Free Lunches," *73*, November, 1986]. Most articles of this sort are cynical. The occasional exception tends to be by enthusiasts who blindly endorse work that clearly requires a highly skeptical review.

Gottlieb has shown the rare capability of pointing out delusions with regard to "free-energy" machines while retaining an open mind toward the possibility that there may always be something new under the sun.

This Institute has been following machines of this type for a decade. During the last year, numerous anomalies strongly suggested that it may prove possible to extract energy from the universe in ways that have previously eluded us.

Mark Goldes, CEO (Ex W2VRC)
Aesop Institute
Sebastopol CA

SMELL THE FLOWERS

I am not one who normally writes letters to the editor or publisher of anything, but in this case I thought I must because I have never enjoyed reading a magazine as much as I did your copy of December, 1986. You say, why is the December issue any different from any other issue? As far as I can tell, it's not any different; it's just that I have finally taken the time to read your magazine. Up to this time, I thought all ham radio magazines were the same. I would buy one with the idea of looking at all the ads and for any building projects I might want to try and put together and that was it. I would never take the time to read it through. You can bet I will read it through from now on. I wonder how many other people have done the same thing in the past and missed your good magazine. As they say, you should take the time to smell the flowers along the way.

Don Lallier WA1ULQ/0
Blair NE

NOVICE CLASS IDEA

I teach Novice classes here in town and advise all to subscribe to *73*. I think with the next class I will build a subscription into the fee for the class. Every issue is worth saving.

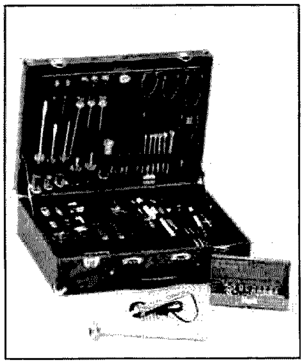
I'd like to see the code stay with the ham test, but maybe as a one-time deal, like 10 wpm for all levels.

Bill Jones N5DOX
Abilene TX

That first thought of yours, Bill, is great! So great that we don't need to mention again the need for a no-code license.—Eds.

NEW PRODUCTS

Number 21 on your Feedback card



Telvac basic service kit from Jensen Tools.

JENSEN TELVAC TOOLS

Jensen Tools has introduced a new service kit for the budget-minded electronic technician. The kit contains 40 high-quality hand tools housed in a wood and vinyl case with removable pallets, a document pouch, and lockable latches. The tool selection includes screwdrivers, pliers, nut and hex drivers, punches, wrenches, soldering equipment, a hemostat, reverse-action tweezers, and other specialty items.

For complete details on Telvac economy tool kits or a free catalog of Jensen tools, please check Reader Service number 203.

THL HL-2K/A

Tokyo Hy-Power Labs has introduced a companion to their HL-1K/A linear amplifier. The HL-2K/A is built around a set of 3-500Z transmitting tubes and is compact enough to fit into any shack. The power supply is built in, and two large front-panel meters monitor plate current, grid current, power output, and plate voltage.

For more information about THL amps, check Reader Service number 208.

VALOR 2 PLUS 2

Valor Enterprises has introduced the 2 plus 2 antenna for amateur radio operators. This dual-band antenna is 1/4 wave long on 2 meters and 1/2 wave long on 70 centimeters with under 2:1 vswr on both bands. The antenna comes with a magnetic mount and is rated at 100 Watts.

For more information, check Reader Service number 211.

SUN-FLEX SCREENS

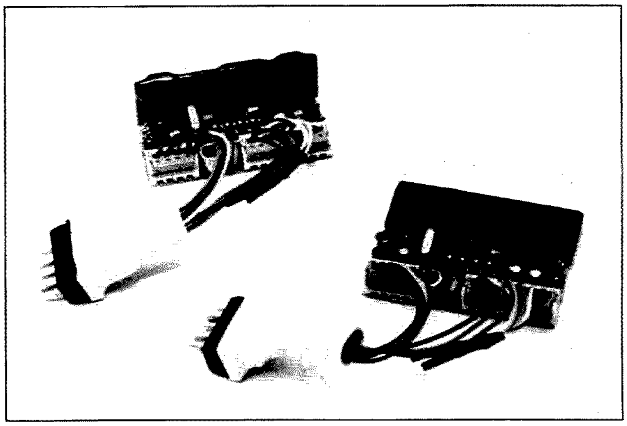
Sun-Flex now offers anti-glare filters for CRTs that also improve contrast by blocking diffuse reflections from bright walls that could wash out displays. These matte black microfiber filters provide a shadow-box effect and fight glare using the same principle used in Venetian blinds. The snap-on screens are available for both monochrome and color monitors.

For more details, please check Reader Service number 212.

CSI CTCSS

Communications Specialists is expanding their line of CTCSS tone boards to include two adapter kits for Standard and TAD USA hand-helds. The Standard 734L/834L may now be fitted with a TS-32HBL low-profile encoder/decoder using an 01-1030 adapter plug. The TS-32HBH high-profile encoder/decoder now fits the TAD M1520-454 by using an 01-1031 adapter plug.

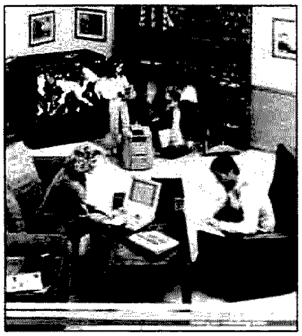
For a complete catalog of CTCSS products, check Reader Service number 210.



Communications Specialists CTCSS boards and adapters.

FREE HEATH CATALOG

Heathkit's new Winter '87 catalog is out, featuring many new projects for the electronics hobbyist. One addition is the IM-2320 Digital Multimeter kit; the unit's single rotary switch selects voltage, current, resistance, or capacitance measurements. The new catalog lists over 400 kits and accessories—to receive a free copy, check Reader Service number 207.



Heath's latest catalog is out.

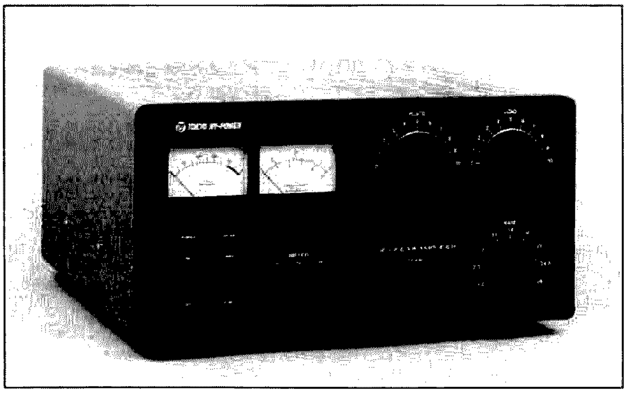
CENTURION BATTERIES

Two new battery packs are available from Centurion International for radios from King. The KR0105 is a 9.6-volt, 800-mAh rechargeable nickel-cadmium set, while the AL0514 is a 13.5-volt, 2,100-mAh throw-away alkaline pack.

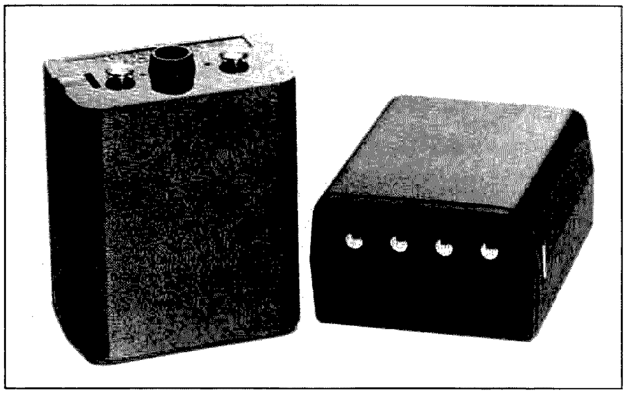
You can get information on both of these new batteries by checking Reader Service number 206.

SIMPSON PROBES

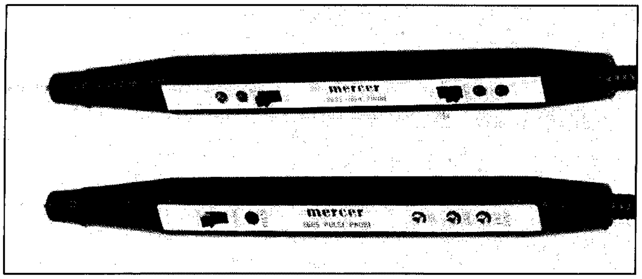
Two new logic probes and a new pulser probe are now being marketed by Mercer Electronics, a division of Simpson Electric. The model 9604 (20 MHz) and model 9605 (50 MHz) logic probes come in a slim case and are useful for troubleshooting both TTL and CMOS circuits. Levels and pulses



Tokyo Hy-Power Labs' HL-2K/A linear.



Two new battery packs from Centurion.

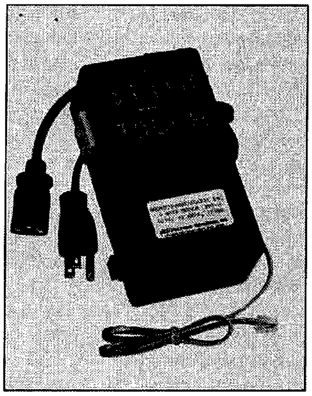


New logic probes from Mercer.

can be observed on two front-mounted LEDs; both models feature a pulse memory.

The Mercer model 9606 pulser can inject 50-us pulses into a logic circuit without the need to isolate ICs. It also has a sync input to allow the use of an external synchronizing signal.

To learn more about the Mercer line of DMMs, digital capacitance meters, and hand-held test instruments, check Reader Service number 209.


Multi-threat protection from Electronic Specialists.

ELECTRONIC SPECIALISTS STATIC CONTROL

Electronic Specialists announces the MPS(22)-2 portable computer protection system for the personal computer on the go. The unit subdues ac power line spikes, electrical noise, modem line spikes, RFI, and static problems. It provides standard and CEE-22 electrical sockets, standard phone RJ-11 modular socket/plug, and a static discharge plate. For more information, check Reader Service number 215.

JENSEN ULTRATORCH

The Ultratorch, available from Jensen Tools, is a compact, cordless combination soldering iron, flameless heat tool, and torch. Its temperature can be adjusted from 394° to 2372°, making it useful for everything from soldering to welding. Soldering/heat ejector, torch ejector, tapered needle soldering tip, heat tip, solder sponge, tip cleaner, and spanner wrench are all included. For more information or for a free catalog, check Reader Service number 216.

LARESCO CODE SOFTWARE

LARESCO has introduced Morse: The Code Machine for the Apple II+/c/e. The program has 31 modes, including frequency selection, special signals send mode, extended sound spacing, and more. The 32-page manual supplied with the program contains lesson plans and methods for learning and enhancing code skills. Also included are graphics, a word processor, and speed ranges from 1–100 wpm. Six versions of this program are available, ranging in price from $29.95 to $89.95. For detailed information, please check Reader Service number 214.

ACE AR-2002

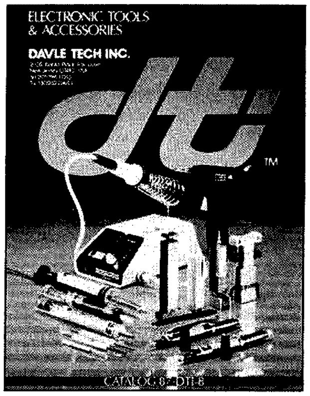
ACE Communications' AR-2002 scanning monitor receiver offers continuous coverage from 25–550 MHz and from 800–1,300 MHz. Other features include 20-channel memory scan, priority scan, band search, multi-mode reception, selectable frequency steps, and a bar-graph signal-strength indicator. The AR-2002 uses a 750-MHz i-f, high-level double-balanced mixing, and a low-noise, wide-band rf amplifier for peak performance.

The ACE AR-2002 retails for $499; for more information, check Reader Service number 204.

The ACE model AR-2002 scanner.

DAVLE CATALOG

Davie Tech's new 36-page catalog of tools and equipment for electronic and telecommunications manufacturing, field service, laboratories, schools, and hobbyists is available direct from Davle Tech. Check Reader Service number 205.



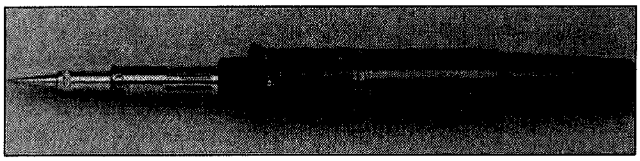
New catalog from Davle Tech.

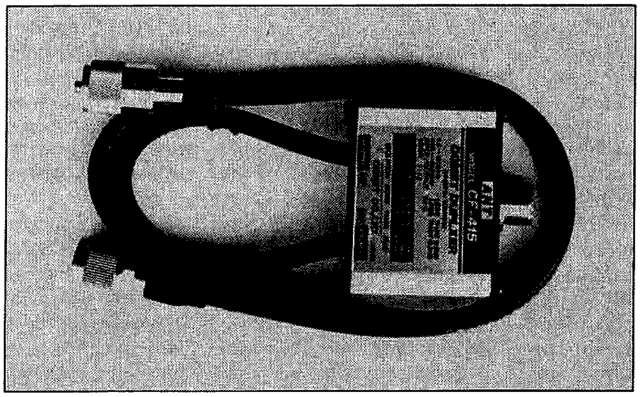
NCG DUPLEXERS

Two new duplexers are available from NCG Company. The CF-415 provides the dual-band operator an extra degree of safety with its high-power capabilities. It safely handles 500 Watts on HF, 400 Watts on 145 MHz, and 250 Watts on 450 MHz. The isolation on both bands is more than 50 dB.

The CF-412 has a very broad frequency range—1.3–450 MHz on the low input and 900–1400 MHz on the high-frequency side. Maximum power is 70 Watts, with isolation more than 39 dB.

You can get information on both of these duplexers by checking Reader Service number 217.


The Ultratorch from Jensen Tools.


NCG's CF-415 duplexer.

73 Review

ICOM IC-275A 2m Multimode

by Peter H. Putman KT2B

ICOM America, Inc.
2380-116th Avenue NE
Bellevue WA 98004
Price class: $1,200

Number 7 on your Feedback card

When *73* called and left the message that "an ICOM IC-275A 2-meter radio just went out by UPS for review," my first thought was: Oh, nuts. Another 2-meter multimode with lots of bells, lots of whistles, a pretty display, and the usual sub-par receiver performance specs. Was I ever wrong!

After extensive testing and on-air use, all I can say to the 2-meter minions is "Keep the faith, baby!" ICOM has been listening to your suggestions and complaints, and their answer is the 275A, a truly high-performance 2-meter multimode for the amateur market. For the first time, you can wrap your fingers around the VHF equivalent of the IC-735 HF radio . . . both in size and in operating features.

This transceiver is a radical departure from ICOM's previous 2-meter designs. The front end is a 3SK121 GaAsFET driving a dual balanced mixer consisting of a pair of 2SK125s, which incidentally is pretty much the "hot" front-end scheme for HF radios nowadays. The dual-conversion scheme allows for the use of an optional narrow CW filter, in addition to passband tuning and a superior adjustable notch filter. Receiver coverage is from 138–174 MHz, allowing reception of MARS, CAP, police, fire, and other municipal services, as well as the 2-meter band.

The transmitter lineup is fairly conventional, running 25 Watts output (adjustable down to 2 Watts) in FM, USB, LSB, or CW. The big improvement here is the massive internal heat sink encasing the PA compartment and power supply. (Yes, the power supply is built-in and runs off 117 V ac.) The usual complement of memory controls is available along with some special twists, and all the necessary adjustments, such as RF GAIN, MIC GAIN, AF TONE, DELAY, and RF POWER are accessible from the front panel via unique push-to-enable and push-to-disable controls.

The 275A is configured with dual vfo's and has a separate memory storage area for 99 different frequencies. You can also store any—and I mean any—desired offset in each memory channel as well as a PL tone on transmit and the desired mode. Offsets can be dialed up from the main vfo knob as well as from standard PL tones. Once you've configured the desired channel information, you just send it to a memory for safekeeping.

Being able to store the mode on each memory channel allows the use of a MODE-SCAN switch, which will scan only those channels whose operating mode corresponds to the front-panel mode selection in use (e.g., if you are currently in USB, only similar memory channels will be scanned). Or, you can scan all of the channels with the more conventional SCAN control. Two pre-defined limits can establish a PROGRAMMED SCAN routine—say, all channels between 146.000 and 147.000 MHz—and channels can even be designated in such a fashion that they will be bypassed during SKIP SCAN operation. These features alone should keep scanner freaks busy for a few months.

The dual vfo's run independently and can be equalized or their contents sent to a memory channel quite easily. As if that wasn't enough, you can also designate a CALL channel (other manufacturers call this a PRIORITY channel), which the transceiver will check on every few seconds during normal scanning operations. The vfo's can also be split if desired, but I can think of only one use for this function, and the repeater offsets take care of that quite nicely. It goes without saying that the display frequency can be locked, and the tuning dial accommodates multiple tuning rates depending on the mode selected.

For FM mode, these rates are 5 kHz and 1 kHz per step, while in weak-signal modes (USB, LSB, CW) the rates are 1 kHz and 10 Hz per step. To anticipate your next question, yes, ICOM has incorporated an RIT circuit allowing excursions of up to 9.9 kHz above or below the displayed frequency. This might be useful if you happen to be working someone with an older tube-type vfo rig who is blissfully galloping up and down the band. (You never know when one of those old HW-20 "Pawnee" rigs might show up!)

Operating modes are selected from the front panel. Depressing the desired button results in an audible "beep," which I find somewhat annoying but tolerable. You can disable this function via an internal control, however. Depressing the CW switch twice will activate the optional CW filter, which is either 250 Hz or 500 Hz depending on whether you read the owner's manual or the latest ICOM advertisements. Such a filter would come in handy during moonbounce operations or when severe QRM is present, such as during a contest.

Also enabled from this area is the built-in noise blanker, which gives adequate results for the more common forms of line noise usually encountered during the winter months. A compressor option is built-in, although I didn't have a chance to try it out. Provision is also made for a mast-mounted preamplifier option (model AG-25) to be controlled from the front panel, and the agc time constant is also selectable here. AF GAIN and SQUELCH sensitivity controls are located to the left of the mode switches, while the PASSBAND TUNING and NOTCH controls are located to the right of the front panel by the RIT and A=B controls.

Just below the main panel you'll find a row of controls with their shafts fully recessed. Depressing any of these shafts results in an "on-off" toggle operation, and the control shaft emerges for adjustment. You can set up the microphone gain, rf gain, power output, and delay on the CW transceive line. A tone control is also provided, continuing a tradition started on the IC-740. (I usually leave it in the full treble position.) The meter can select either relative signal strength in S-units (weak-signal modes) or function as a discriminator meter in FM mode. During transmit, it will either display ALC settings or rf output power.

Provision has also been made for the usual SPEECH module for aural reinforcement of control and frequency settings. (These things must be all the rage in Japan!) This can truly be classified as a bell-and-whistle function, as it serves no other useful purpose.

Two other controls, however, serve very useful purposes: first, the DATA switch, which allows extremely fast TX/RX switchover for AMTOR and packet-radio operation. ICOM claims that a newer synthesizer design allows for lockup in just five milliseconds, and the offshoot of this is the second notable control, CW BK-IN, the break-in setting. This is the first 2-meter multimode I've used with full break-in on CW, and is it a joy to use! You can also select semi-break-in or conventional switched TX/RX operation if desired.

A standard SO-239 connector is used for the antenna. The ac power cord fits into the 3-pin socket at the left of the rear panel, and if you want to use a separate dc supply, the access is through the connector behind the large plastic plug at the rear center. The CW key connection is at the lower left, and the CW BK-IN slide switch is to the immediate right of it. CW sidetone can be adjusted from the rear panel, as can the compressor level and (of all things) the microphone tone. The front-panel meter also displays swr and is set up by the rear-panel switch marked TX METER. An external speaker jack is also provided.

Rounding out the rear-panel connections are two multi-pin connects marked ACCESSORY and AQS. The former allows access in the same manner as the old 24-pin MOLEX connectors used on the 740/745/751/251/271 series of radios to various monitoring and keying functions and permits ALC control of an outboard linear amplifier. Used in conjunction with the optional CT-15 AQS adapter, the AQS (Amateur Quinmatic System) connection allows empty channel access, callsign-programmable squelch, digital code squelch (similar to Kenwood's DCS system), up to 14-character message transfer for display, and digital code storage.

For packet and computer enthusiasts, remote control via an RS-232 interface is made through a rear-panel mini phone jack. Although I didn't attempt to use the interface, it is possible to control the dual vfo's, memory selection and frequency/mode selection from

your PC if desired, just as on the newer HF transceivers. No doubt software will be available from ICOM to do this. For packet users, ICOM details a suggested interface to an RS-232 port using a voltage level converter, and the system used is CSMA (Carrier Sense Multiple Access) standard. RTTY fans can employ AFSK through the ACCESSORY terminal, and in both modes the DATA switch allows transceive switchover in three milliseconds. (Any outboard preamp is disabled during this operation.)

Still not satisfied? Well, if you are into slow-scan television (SSTV), operation is possible via either the front-panel microphone connector or the rear-panel ACCESSORY connector. And that OUGHT to take care of any desired operating mode, except AM. No, wait—I forgot OSCAR users! But ICOM didn't, and an interface is provided to work with the soon-to-be-released IC-475A/H for split-band transceive operation, with uplink at 435 MHz and downlink in the 145-MHz range. Of course, you can use this radio with your present 435 OSCAR uplink station, dialing both manually.

Performance

As you can see, this is a radical departure from previous ICOM 2-meter transceivers. And I haven't even touched on how well it works yet, so let's now take a look at some qualitative measurements, using the Hewlett-Packard 608F rf signal generator, the Boonton 92 rf millivoltmeter, and Bird wattmeters with precision attenuators. The first thing I checked out was the performance of that GaAsFET front end and MOSFET mixer. Table 1 shows the results versus the manufacturer's claims (where applicable).

Specification	Measured	ICOM Claimed
Minimum Discernible Signal		
(USB/CW)	Less than −138 dB	N/A
(FM)	Less than −105 dB	N/A
Receiver Sensitivity*		
USB/LSB/CW		
for10 dB S/N	.25 uV	Less than .1 uV
FM for 10 dB S/N	.20 uV	Less than .18 uV
Squelch Law		
USB/LSB/CW	.35 uV	Less than .56 uV
FM	.15 uV	Less than .1 uV
Selectivity		
USB/LSB/CW	2.0 kHz/6 dB	2.2 kHz/6 dB
	5.0 kHz/60 dB	4.2 kHz/60 dB
FM	10.0 kHz/6 dB	15.0 kHz/6 dB
	20.0 kHz/60 dB	30.0 kHz/60 dB
Conversion Gain		
at first i-f stage	25 dBm	N/A
1-dB Compression		
at output of mixer	+7 dBm	N/A
Calculated Dynamic		
Range	121 dB	N/A
Transmitted Power Out		
@ 146.000 MHz		
into 50 Ohms	24 Watts	25 Watts
Low Power		
@ 146.000 MHz	2 Watts	2.5 Watts
Measured Transmit		
Frequency		
@ 146.000 MHz	146.0003 MHz	N/A

*Additional measurements were made of receiver sensitivity for 10 dB S/N @ 138.00 and 174.00 MHz. They are: .6 uV USB/LSB/CW and .75 uV FM @ 138.00 MHz, and .5 uV USB/LSB/CW and .55 uV FM @ 174.00 MHz.

Table 1. IC-275A performance (measured at 146.000 MHz).

How well does the thing work? Pretty darn good, and as well as a comparable linear transverter and HF radio. The only exception is the increased sensitivity of the transverter, but other than that they compared favorably during the January VHF Sweepstakes. The human engineering is good, as those controls rarely needed are tucked out of the way. I'd prefer bigger knobs on the passband tuning and notch filter controls, as they were employed several times to flush out a weak grid square through local QRM.

Users familiar with these controls from ICOM HF transceivers will feel right at home here. The PBT functions much like an i-f shift control, varying the passband of the receive crystal filter to either side of the desired frequency, hopefully shifting QRM out of the passband. Steady carriers or QRM from CW notes can be shut out with judicious use of the notch filter. It can even help attenuate a "birdie" or spurious signals from nearby CATV systems.

In my system, I use a Microwave Modules MML 200S 200-Watt amplifier with a 12-dB-gain GaAsFET preamp after an MMT 144-28R transverter. The addition of an SPDT coax switch allowed quick and easy comparison of the transverter and 275A. The dynamic range of the MMT 144-28R is about 132 dB and its 1-dB compression point is +6 dBm, so I felt this was a fair test, especially with the GaAsFET available on weak signals. On they went, with both units running neck-and-neck on most contacts. The MMT enjoyed a definite edge on the weakest of signals, especially during "crunch time" when a strong local station was but 5 to 10 kHz away.

The ICOM did give a good accounting of itself here but just couldn't pull the signals out of the noise enough to make clear copy possible. (Now, remember we're talking about signals 1/4 to 1/2 dB out of the noise. That's not much to work with for any radio!) However, overall the receiver performance of the 275A represents a quantum leap over previous 2-meter multimodes I've used. Kicking in the outboard MML preamp made all the difference for the 275A, so I suspect that adding the accessory mast-mounted ICOM unit wouldn't be a bad idea.

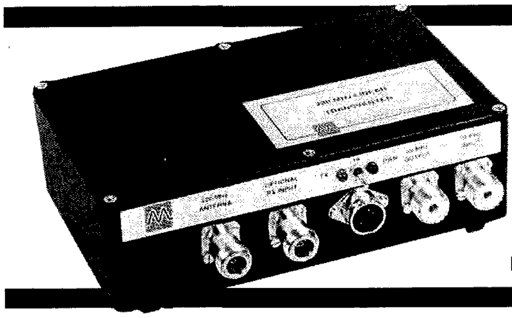
Received audio reports were excellent. One comment about the microphone audio being a bit "hot" was quickly alleviated by adjustment of the front-panel control. Audio frequency response was judged to be adequate while operating in FM mode on simplex. The 25 Watts and my 200-Watt linear made a nice "one-two punch" that had me breaking through pileups (yes, we have them on VHF, too, you HF types) to work stations in Virginia and Massachusetts on the first try. Also, I am plagued with a constant high-level "buzz" every January Sweepstakes in this neighborhood, which the switchable noise blanker took care of in a reasonably acceptable manner. I say reasonably because my IC-740 with its adjustable noise blanker was able to get rid of it completely. Are you listening, ICOM?

Note that ICOM has done away with VOX operation on the 275A, and I say good riddance to it. Most VOX circuits make keying a remote mast-mounted preamp difficult, to say the least. The DELAY control on the front panel serves only to determine the drop-out interval from TX to RX while in semi-break-in CW mode. I preferred the much faster full-break-in mode selected from the rear panel and bypassed the outboard amplifier for some truly quick CW contacts. (The keying of an outboard amplifier will remain a problem with this mode, and I'm curious to see if the 275H, with its 100-Watt final, will also incorporate full QSK.)

With all good things there's a catch, and it's a big one. This radio will set you back about $1,200, and that's without the preamp, the filter option, or any of the other goodies ICOM offers. The companion IC-275H rolls in with 100 Watts but no doubt will carry at least $150–$200 more on the price tag. That makes it the most expensive 2-meter multimode ever made and sold in this country (probably in the world, as well). However, there's no doubt you get a lot for your money, what with the filter options, PBT/notch, ac supply, memories, full-break-in CW, and more possible operating modes than you can imagine.

Conclusion

The IC-275A is an exceptionally well-designed, high-performance 144-MHz multimode transceiver, and if you are willing to spend the money for one, you won't be disappointed. This might be all the 2-meter radio you'll ever need, especially if you are into the more exotic modes such as EME, packet, AFSK RTTY, and meteor scatter. Its design lends itself well to interfacing with outboard linear amplifiers, mast-mounted preamplifiers, computers for packet work, terminal units, and even with remote-base systems. The fact that it doubles as a public-service band and MARS receiver with four scan options is just icing on the cake. Now, if ICOM would just make a 6-meter version of this transceiver. ■



Microwave Modules MMT 220/28 220-MHz Linear Transverter

by Peter H. Putman KT2B

Imported by: The PX Shack
52 Stonewyck Drive
Belle Mead NJ 08502

Price class: $250

It's been a long time coming, but 220 fanatics can finally breathe a sigh of relief: Microwave Modules Ltd. of Liverpool, England, has released the first commercially built 220-MHz linear transverter to the North American market.

Those familiar with the high-quality MMT line of transverters should be pleased with the latest effort: 15 Watts output from 220 to 225 MHz, and transverter drive levels in the microwatt region. The design is based on the current MMT 144/28 and is housed in the familiar black box. Connections are simple: dc power and keying through a five-pin connector, 28-MHz transmit in, 28-MHz receive out, and 220-MHz transceive antenna jack. An additional connector is available if you want to split the 220 transmit and receive lines, as would be the case if you were using a high-power amplifier with its own antenna relay.

As with all of the "black boxes," you can tuck the MMT 220/28 out of sight once it's connected. For those of you who like to have everything in sight, the front panel includes two LEDs. One glows red when power is applied and the other glows green when in the transmit mode. An additional switch selects high or low band segment ranges.

The circuit design is simple. See Photo A for an interior view. Up to 300 mW of drive can be applied to the dual-balanced MOSFET transmit mixer, which employs a pair of 3SK51 or 3N204 devices. LO injection at two different selectable frequencies—96 MHz and 97.5 MHz—is doubled to either 192 or 195 MHz. The reason for this is to enable coverage of different band segments, as I'll show in a moment.

BFY90 and 2N5109 devices then buffer and amplify this 220-MHz signal. The driver is a 2N6080, and the final device is a CSF-Thompson SD1274 rated at better than 40 Watts dissipation, giving a good safety factor by running well under its rating.

The receiver lineup is conventional, with 3N204 devices used in the front end and receive mixer. These MOSFETs don't necessarily have the lowest noise-figure in the world, but they are rugged and their use yields a high 1-dB compression figure for the front end. Should you desire some extra gain, a low-noise GaAsFET with a pad could be employed ahead of the 3N204. It probably wouldn't be advisable to run more than 12–13 dB of gain from such a preamp into the 3N204 without significant degrading of the compression point.

Getting back to the dual LO function: One of the problems covering VHF band segments with HF transceivers is that those segments are considerably larger than the standard 28–30-MHz i-f used. This has been a problem until recently for those 2-meter users who wished to employ their HF rigs for SSB, CW, and FM work. With the advent of continuous-coverage HF rigs, it's quite simple to enable the radio to transmit from 26–30 MHz, usually by clipping a diode, removing a jumper, etc. When in the transverter mode, this will yield sufficient drive over the 4-MHz segment to allow full coverage of 2 meters.

A similar problem exists at 220 MHz because the band segment is 5 MHz wide. Microwave Modules' answer is to supply two separate LO crystals. With the standard conversion scheme, 220–222 MHz will downconvert to 28–30 MHz for the weak-signal stations. By selecting the second LO, 223–225 MHz is downconverted to 28–30 MHz, allowing simplex work and some repeater access using split vfo's.

If you have enabled your HF rig to supply you with a low-level signal (typically 10 mW or less) across this range, you're in business. Otherwise, you'll be limited to accessing repeaters with inputs above 223.00 MHz or operating simplex while on FM. The best part of it all is that you can get your feet wet on 220 using all modes without spending a lot of cash to do it, especially since no manufacturers currently make a 220-MHz multimode transceiver for the North American market.

The next step was to put the MMT 220/28 into the lab for some performance tests. First, I checked transmit linearity in both the LO and HI crystal positions, using a coaxial switch, Hewlett-Packard 608F signal generator, and Boonton 92 rf millivoltmeter. The test frequency was 220.100 MHz, and the i-f transmit and i-f receive coils were peaked at 27.000 MHz for maximum gain. All measurements were made with the input attenuator at maximum sensitivity and the fixed 1K attenuator strapped out of the circuit.

Transmit Linearity
LO Position: i-f = 28.100 MHz

Input Signal (dBm)	Output Signal (Watts)
−14	1
−12	2
−10	3
−9	4
−7	5
−6.5	6
−5.5	7
−4.5	8
−4	9
−3	10
0	13
+2 (saturated)	15

Transmit Linearity
HI Position: i-f = 25.100 MHz

Input Signal (dBm)	Output Signal (Watts)
−18	1
−16	2
−14	3
−13	4
−12	5
−11.5	6
−10.5	7
−10	8

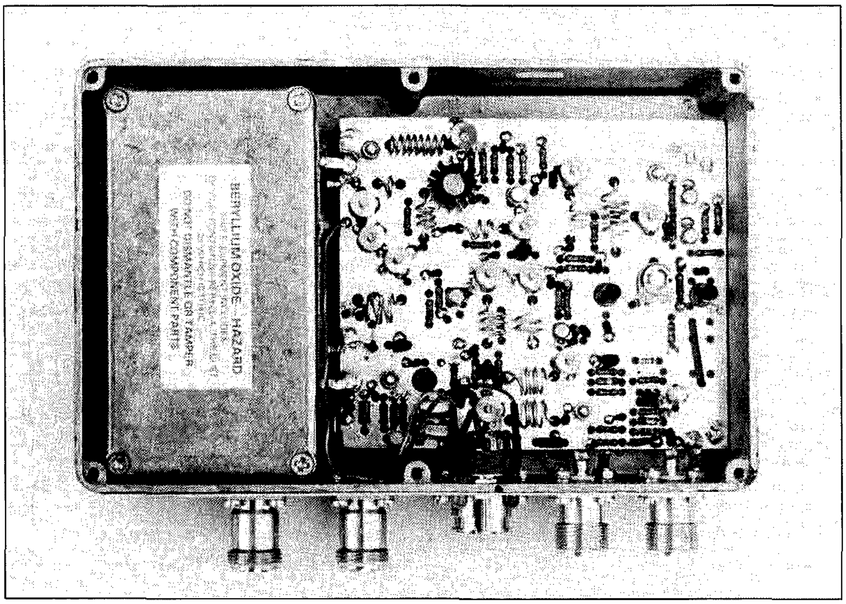


Photo A. Interior view of the MMT 220/28. The i-f board is on the right and the power amplifier compartment is on the left.

−9	9
−8	10
−6.5	13
−2 (saturated)	15

Obviously, the dual MOSFET mixers are sensitive. As a reference, 0 dBm is 1 milliwatt, so only 1.5 milliwatts are needed for full output at 28.100 MHz, and only .75 milliwatts of drive at 25.100 MHz. This should take care of those ICOM HF rigs with three or less milliwatts of drive, such as the IC-730 and IC-745. Transmit output was fairly consistent from 220–225 MHz (measured on a Bird 43 with 50C slug into a 25-Watt Termaline load). It varied by only 2 Watts across the full band segment in the HI position. Variation was not noticeable across 220–222 MHz while in the LO position.

Now for some receiver performance specifications. These were measured in the HI position, with the i-f receiver coil peaked at 27.000 MHz.

Receiver Performance

Specification	Measured
Minimum Discernible Signal (MDS)	Less than −127 dB
Sensitivity for 10-dB S/N ratio	.25 uV at 220.100 MHz
Conversion Gain at 27 MHz	28 dBm
1-dB Compression Point	+3 dBm

One note about conversion gain: Many users of transverters feel that unless they hear a loud "rushing" sound when their unit is connected to an HF rig (usually the result of too much conversion gain) the receiver section of the transverter isn't working correctly. Nothing could be further from the truth! I've even seen some operators kick in the 20-dB preamp on these HF rigs to bring up signal strength. Sorry, Charlie—the two are distinct functions. Ideally, conversion gain should be in the area of 25–30 dB. Much more than that and you'll have higher than "S0" noise level readings which are, of course, nonsense.

As on all MMT units, rf VOX-type keying is standard, but I prefer and highly recommend straight dc keying through pin 1 on the five-pin power connector. If you use the former, the delay is preset to about 1/2 second on dropout. The connector lineup is SO-239 at 28 MHz and type N at 220 MHz, which is a little unusual since most 220 amplifiers use SO-239s. The connector kit does come with a very nice type N connector made in France that goes together quite easily. Power requirements are about 3 Amps on transmit and less than 500 mA on receive.

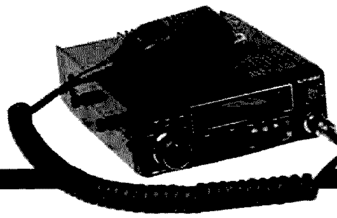
One last note: Microwave Modules has discontinued using the crystal-can type T-R relay found on older MMT units, using separate connections at 28 MHz. Most of the newer HF radios with transverter functions provide those two connections. If your HF radio provides only one transceive connection at 28 MHz, you'll have to employ an SPST relay such as a DK-77 (commonly found at flea markets for about $10–$15) to make the switchover.

To sum up, Microwave Modules has finally filled a big gap for the VHF enthusiast by "plugging the hole" in their product line at 220 MHz with a well-designed and versatile transverter. And that's not all, folks! I've been told by the importer that plans call for a 220-MHz low-noise preamp and 220-MHz power amplifiers to be added before too long. Just throw in a 220-MHz yagi, and you'll have a hot setup for weak-signal work, packet, FM, and even moonbounce.

For more information on the MMT 220/28, circle number 202 on your Reader Service card. ■

Alinco ALR-206T 144-MHz FM Mobile Transceiver

by Peter H. Putman KT2B



Alinco Electronics, Inc.
20705 S. Western Avenue, Suite 104
Torrance CA 90501
Price class: $358

Alinco Electronics of Japan burst onto the scene at Dayton last April with a dizzying array of products, including some very impressive power supplies, a 2-meter handheld radio, and the subject of this review. Curious hams bought hundreds of these products, and initial comments were extremely favorable! Not only that, but the prices were quite reasonable.

With that in mind, it should come as no surprise that I obtained an ALR-206T mobile FM transceiver for review, and can say that I am very impressed with it. This is without a doubt one of the best 2-meter FM transceivers I've ever used for a variety of reasons, primarily the super performance of the receiver section and the simplicity of operation.

Out of the Box

The ALR-206T comes in a small package. It measures only 5-1/2" wide by 2" high by 7-1/2" deep, weighing in at 2.8 pounds. Transmitter power is rated at 25 Watts high and 5 Watts low. A keyboard-type encoding microphone is used for both touchtone™ signals and frequency selection.

The control layout is strictly "no-frills," with front-panel controls selecting tuning, volume, squelch, high/low power, scan, offset, dial lamp, and standard repeater offsets. That's it!

Operation

The microphone provides control of memory selection, band scan, and tuning rate. A lock switch disables the keypad when not in use to prevent accidental tone signaling or frequency excursions while driving! One complaint right away: The cord supplied with this microphone is entirely too stiff. Several users have complained that the end of the cord pulls right out of the 8-pin plug after a few months of use. Alinco should definitely switch to a more flexible (and longer) coiled cord.

The tuning control on the front panel is sort of unique in that it behaves much like the older PTO (permeability-tuned oscillator) type controls on Astro and Cubic HF radios. It's actually a five-position switch, and you determine the automatic tuning rate by where the switch is rotated. To go up in frequency, rotate it to the right; to go down, rotate it to the left. Two positions on each side set tuning rates of 5-kHz steps at 1/2- or 1/20-second intervals.

Receiver Performance	
Sensitivity, for 10 dB quieting	.2 uV
Sensitivity, for 20 dB quieting	Less than −6 dB
Squelch Law	.35 uV
Sensitivity for S9 indication	1.5 uV
Sensitivity for full scale	2.5 uV
Selectivity (with −6 dB signal)	Better than −10 dB at ±5 kHz
	Better than −40 dB at ±10 kHz
	−60 dB at ±15 kHz
Transmitter Performance	
Power Output, High	25 Watts at 13.8 V dc from 144.0–148.0 MHz
Power Output, Low	5 Watts at 13.8 V dc from 144.0–148.0 MHz
Displayed Frequency	146.0000 MHz
Measured Frequency	146.0004 MHz

Table 1. Bench test results for the ALR-206T. Test equipment used included: a Hewlett-Packard 608F signal generator, a Boonton 92 rf millivoltmeter, and a Bird 43 wattmeter with 50C and 10C slugs. All measurements were made at 146.000 MHz unless otherwise noted.

Of course, to go anywhere in a hurry, just enter the last four digits of the desired frequency via the keypad (e.g., 146.985 MHz enters as 6985). Selection is *complete once* the final digit is entered. You can also clear the display and the frequency in use by depressing the clear button, which is colored yellow. Up to ten of your favorite 2-meter frequencies can be stored in memory. In addition, you can program memory #10 as a nonstandard offset. Standard offsets are −600 and +600 kHz, selectable from the front panel.

The display is a green LCD type, and a lamp switch provides additional illumination. The display shows the frequency in use, the offset selected, the memory channel selected, and has a signal strength/power meter. I found the lamp necessary most of the time to make the display readable, and suspect that lamp burnout will be a headache for the U.S. distributors as a result. The signal strength meter is of the ascending-mark type, with solid marks up to S9 and two outlines above that level. The three LEDs to the left of the display show TX/BUSY, LOW (when low power is selected), and DUP (when either offset is selected).

Alinco gets high marks for the well-designed simple panel layout. Each control is easy to find and each control's function is very obvious. Most importantly, the three most important controls—tuning, volume, and squelch—are in the clear and the knobs are just the right size. Human engineering is so often overlooked in the smaller FM 2-meter transceivers, but not here.

The keypad microphone is equally easy to use. Tone reinforcement lets you know if you've hit the keys correctly. When entering memories into the radio, the last step correctly executed results in a low-frequency tone. Entering those memories is very easyl Just dial up the frequency desired, depress the "F" and "MR" keys, then the number of the memory channel you want it stored in.

One feature I never use but *some other* owners have complained to me about is the program scan mode, where you define the upper and lower limits of a scan area (say, 145.500 to 146.500 MHz). It takes a bit of programming to set it up, and if you transmit or turn the power off, the program is lost. Personally, I don't consider this a drawback, but if you like to scan band segments it could be a hassle.

Audio output from the internal speaker is about 2 Watts, more than enough for mobile operation. I strongly suggest an external speaker, as I do with most mobile radios, since most of your audio is directed into either the floor or upholstery from the internal speaker. Some users have complained of distorted audio on cold days, but I have yet to notice this effect after several chilly mornings (below 20 degrees). Transmitted audio had a slight tinny quality, bringing reports that "It doesn't sound like you!" from stations used to my old Kenwood TR-7400A. This could easily be corrected by reshaping the response of the electret condenser microphone, which has plenty of high-frequency response.

Mobile operation in general is a breeze, with the exception of that stiff and short microphone cord. I mounted the unit below my ICOM IC-37A, creating a very compact two-band station. The Alinco-supplied mounting bracket comes with four plastic spacers that attach to the radio. They slide along a cutout into the bracket, with the rearward spacers locking Into a rear section of the slot. Three adjustable positions are available. It makes for an unusual bracket, but it is strong. Rear-panel connections are for dc power, antenna, and external speaker. The heat sink seems a little light for 25 Watts, but it never got appreciably warm in daily use.

Performance

As I mentioned earlier, the ALR-206T has about the best receiver I've seen yet in a 2-meter transceiver. One big reason is the filter lineup, with four poles at 10.7 MHz and two poles at 455 kHz. Alinco claims selectivity figures of less than ±15 kHz at −60 dB, which would be a radical departure from most of the Japanese 2-meter transceivers I've used or seen. But lo and behold, it really is that selective!

Where I live in northern New Jersey, there are considerable problems with 15-kHz channel spacing. One case in particular involves a local repeater that I use on occasion. Its users experience splash-over and adjacent-channel interference from a strong repeater in New York City just 15 kHz higher. Despite all of the arguments about whose fault this problem is, or whose transmitter is or isn't clean, the fact is that the situation hasn't been resolved. With the ALR-206T available, it might not need to bel This is the first FM transceiver I've used that thumbs its nose at the problem.

Previously, while driving within line-of-sight of the Manhattan skyline, this adjacent-channel problem was so severe it made communications on the local repeater impossible, especially with a ridge of hills between my car and that repeater. With the Alinco the problem is virtually nonexistent, even when I drive within five miles of the New York City repeater. It's difficult to even hear them 10 kHz off frequency. It goes without saying that I was eager to run the ALR-206T on the test bench to find out how good that receiver is!

Take a look at the results of the bench testing shown in Table 1. Impressed? You should be. This is a lot of radio for a little money that is exceptionally engineered. No useless bells and whistles—just those features needed for everyday operation. It's rugged, small, and attractive. Other than the complaints regarding the microphone cord, program scan, and panel light, I have nothing but nice things to say about the Alinco ALR-206T, especially that sharp receiver! For more information about the Alinco ALR-206T, please check Reader Service number 201.■

Cornelio Nouel KG5B
4966 Paseo del Rey Drive
Brownsville TX 78521

40 Meters In A Nutshell

This clever 7-MHz transceiver slips right into your pocket (you may have to enlarge your pockets a bit).

Number 1 on your Feedback card

One of my greatest satisfactions is when I make a QSO using a homemade project. The particular one shown here (Photo A) started as a simple vfo to be used with my present SSB transceiver. It worked so well that I decided to build a small portable receiver that I could take on trips or use as an emergency set. The performance of the receiver was amazing, especially considering its simplicity, so I went whole hog and built the transceiver, which I will describe here.

The transceiver is built using three modules: the vfo (or bfo when on receive), the receiver, and the transmitter (see Fig. 1). All

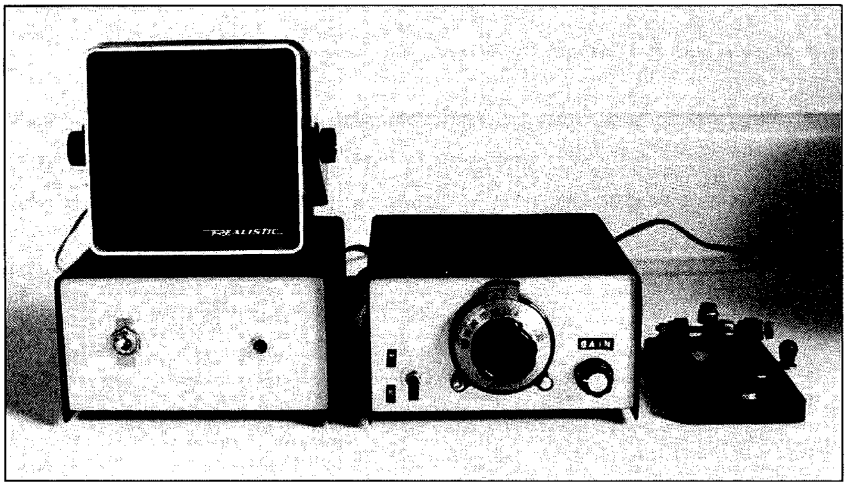


Photo A. The QRP transceiver and matching power supply.

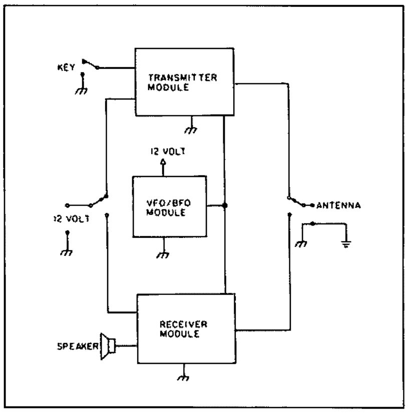


Fig. 1. Transceiver block diagram.

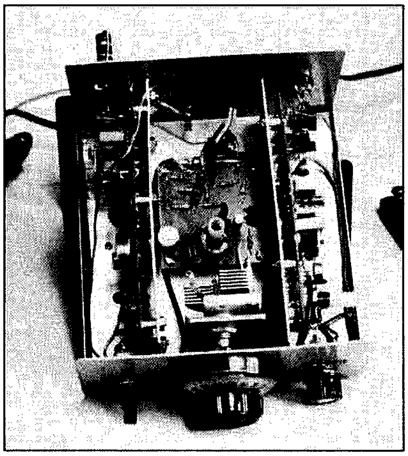


Photo B. Inside view of the QRP transceiver.

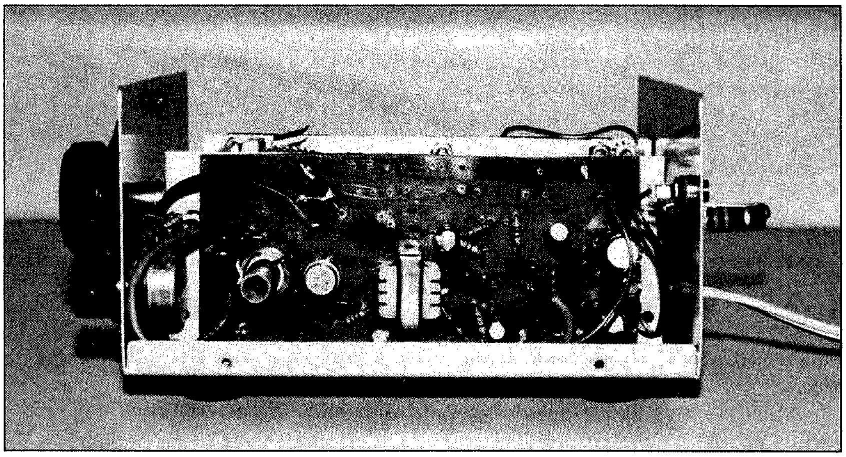


Photo C. The receiver module.

components used are widely available, and all circuits are proven designs found in various handbooks and other literature. It should not be too difficult to depart from my setup if you consult the appropriate references.

The Vfo

The vfo consists of a FET Hartley oscillator (Q1) and a two-transistor buffer with shunt feedback (Q2, Q3) to provide adequate isolation. An rms output of about .1 volts is obtained to drive the transmitter module or to be used as a local oscillator (bfo) for the direct conversion receiver front end. With the values shown, the coverage will be just about 100 kHz and almost perfectly linear; thus a direct readout is obtained with a dial setting of 0–100.

A 100-kHz bandspread was chosen because most CW operation is confined to small segments of the 40-meter band. With the dial mechanism shown, each knob rotation will correspond to 25 kHz, which is adequate for this type of operation. Incidentally, the receiver will copy SSB amazingly well. The transceiver requires a well-filtered and regulated power supply, and a secondary regulation is provided for the oscillator by the zener diode, D2 (see Fig. 2).

As I said before, the project evolved from a simple vfo. So when the transceiver was finally assembled, an oscillator offset was needed to provide the correct transmit/receive relationship. Otherwise, it would be necessary to retune between transmit and receive when in QSO with other transceivers, especially those without an RIT. The circuit is very simple and is shown below the vfo/bfo schematic (Fig. 4). It is mounted on a small solder terminal strip next to the 100-pF variable capacitor.

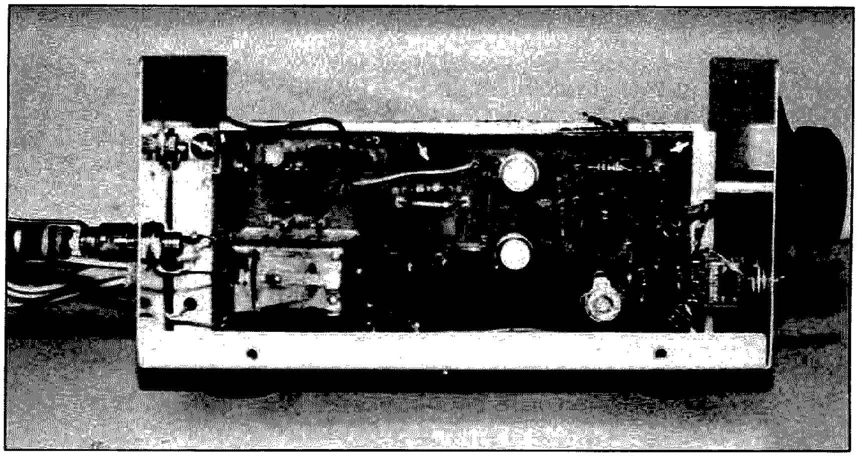


Photo D. The transceiver module.

The Receiver

The receiver is a direct conversion design and it is simplicity itself. It uses a CA-3028 chip as a balanced product detector in the front end, a 2N3904 transistor as an audio preamplifier, and an LM-386 0.4-Watt-output amplifier to drive a speaker or headphones. I used a small slug-tuned coil in the front end, but there is no reason why a small powdered-iron toroid cannot be used instead with an adequate trimmer capacitor (see the receiver module parts list and Fig. 5).

The product detector, IC1, is coupled to the 2N3904 by means of T1, which is used in auto-transformer fashion. I did this in order to lower the output impedance of the product detector, thus improving cross-modulation and blocking characteristics. However, I found later that a simple attenuator was still necessary in some cases, so I added R13 and SW1. With SW1 closed, cross-modulation is greatly reduced, while sensitivity is still adequate.

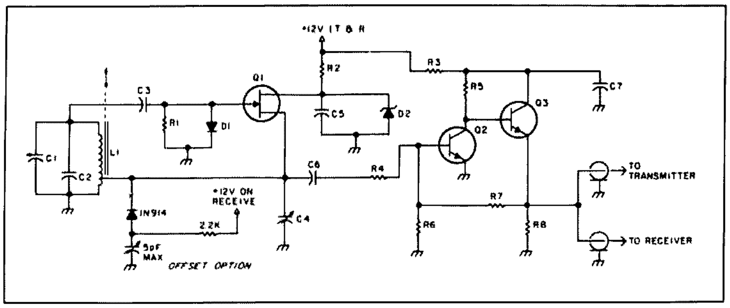


Fig. 2. Vfo schematic.

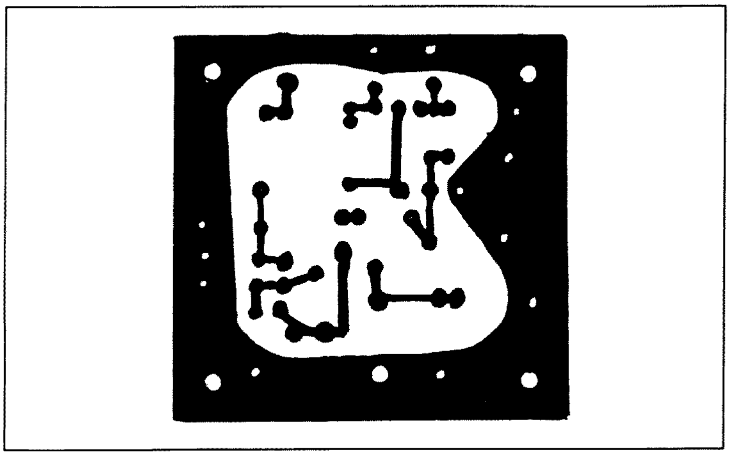


Fig. 3. Vfo module, foil side.

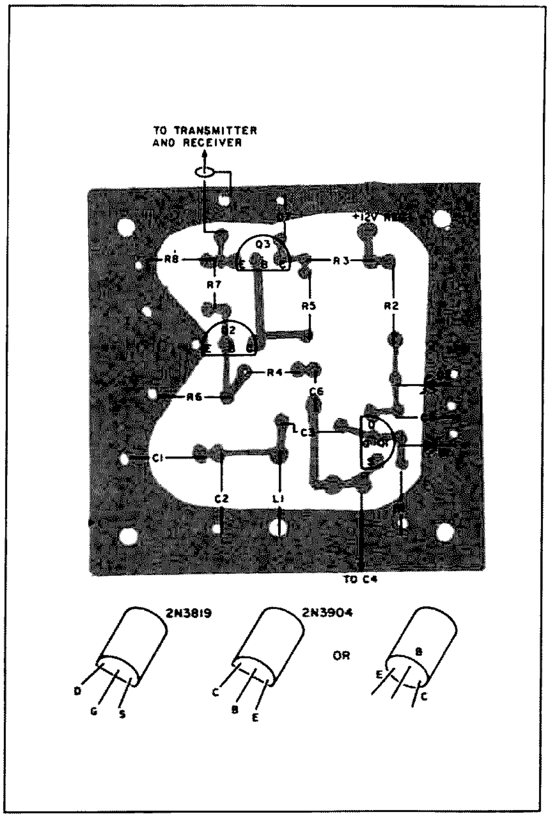


Fig. 4. Vfo module, component side.

In order to shape the audio response to favor the reception of CW signals, I included various capacitors in the circuit. C4 and C6 help to center the audio bandpass around 1 kHz. C6 is connected to the 8-Ohm winding, but there are no further connections to the winding. I did not want to include too many bells and whistles in this project in the interest of cost and simplicity. Nevertheless, the receiver will detect a 0.1-uV signal, but its main limitation is due to its being able to receive both sidebands simultaneously.

The Transmitter

You could argue about the futility of using a 1-Watt transmitter with a receiver capable of receiving very weak signals, but when I considered that a 1-Watt signal is only about three S-units below a 100-Watt one, things didn't seem so bad. Of course, there are advantages in running low power: low cost, portability, and compactness. After all, it's the antenna that does most of the job!

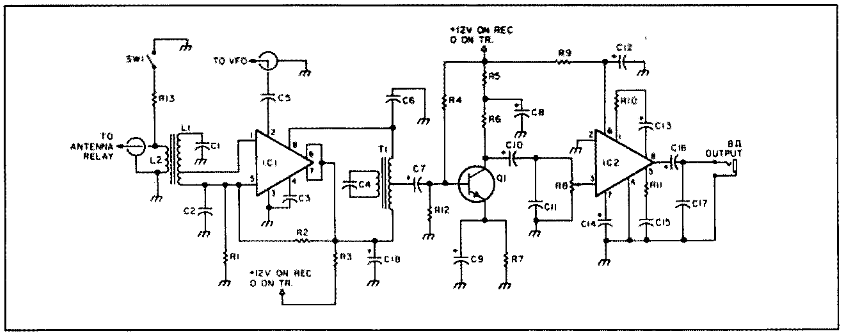


Fig. 5. Receiver module schematic.

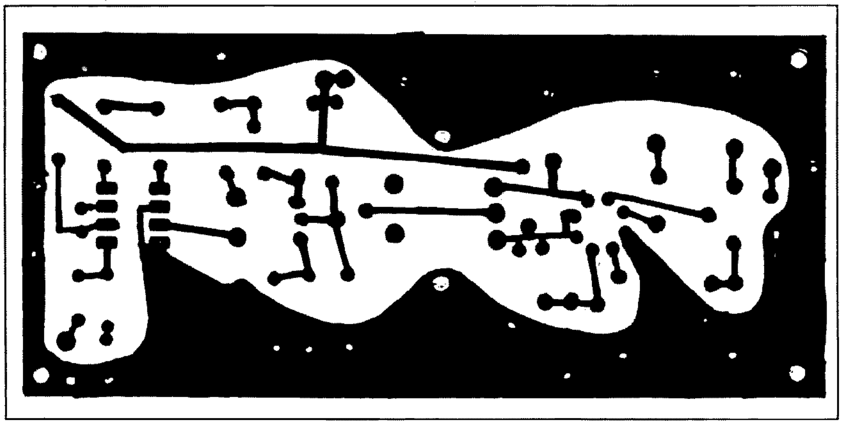


Fig. 6. Receiver module, foil side.

The transmitter consists of two stages—a 2N2222 driver stage and a 2N3866 (or similar) class C power amplifier. Using a small toroid, the driver is coupled through a tuned circuit to the base of the amplifier. The output circuit is a one-section half-wave network. The impedances involved are 50 Ohms to 50 Ohms, so no transformation takes place. The transmitter module also incorporates the antenna changeover relay, the keying circuit, and the sidetone generator. The power output is more than 1 Watt, and the second harmonic rejection is better than 20 dB down.

The sidetone level is controlled by a small PC-type trimmer pot. I drilled a small hole at the back of the cabinet to permit adjusting it from the outside. The relay shown operates with 6 to 8 volts at about 12 mA, so a series resistor is used to drop the voltage. The various leads from RY1 are soldered directly to the appropriate points on the foil side.

The transmit or receive mode is controlled by S1 as shown in Fig. 8. This DPDT switch selects the 12 volts to the corresponding module, while grounding the unused one. The vfo/bfo is, naturally, always on. The transceiver is turned on or off at the power supply.

The current requirements are less than 100 mA during receive and around 300 mA on transmit, key down. When the rig is connected to a 50-Ohm resistive load, full output is obtained, but antenna systems with more than 1.5:1 swr may reduce the output and cause instability or even damage the output transistor. I use a transmatch with my trapped vertical with excellent results.

The keying is clean and I have not detected any spurious responses or emissions. I would like to emphasize the need for a good ground connection to avoid hum problems.

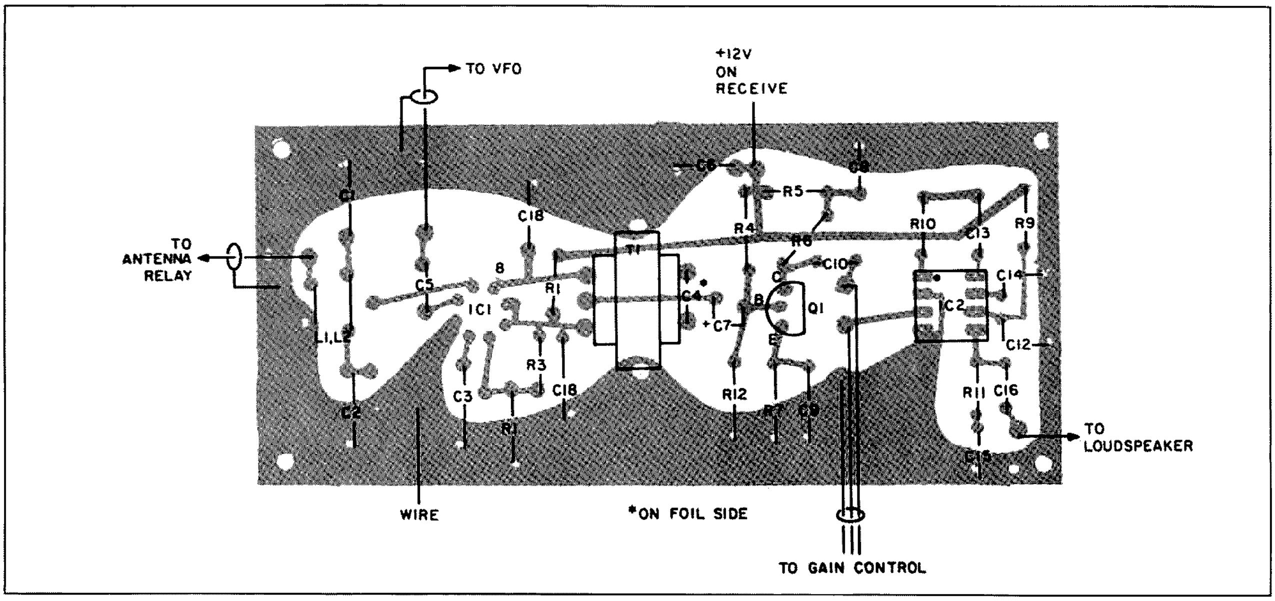


Fig. 7. Receiver module, component side.

Construction

I built the vfo first, using glass-epoxy PC board. The coil is very important; after you wind it, give it a coat of clear plastic (I used Krylon™ spray). Once the components are assembled on the board, you can cement the coil form to the board with epoxy. Some ceramic forms may have a mounting screw or studs that can be soldered directly to the board for support. Photo B shows the position of the vfo board, the capacitor, and the dial.

I mounted the tuning capacitor on a bracket cut from 1/8-inch aluminum angle, but 1/16-inch stock will also do the job. First I drilled the hole for the shaft of the dial, then I positioned the bracket behind the hole and marked it. This ensured good alignment. All the mounting holes for the bracket and the dial were made slightly larger to allow some play. After the vfo components are mounted, you should try it for stability and for a preliminary calibration by listening to it on a suitable receiver. Also, you can check the output with an rf probe; it should be around 0.1 volts rms.

I mounted the receiver and transmitter modules vertically on each side of the vfo using two pieces of L-shaped aluminum made from the rear cover of a 5-1/4" by 3" by 2-1/8" chassis box. The modules are held to these plates by 1/4-inch spacers, and the plates themselves are held to the bottom of the cabinet by the screws that hold the rubber feet. The plates act as shields or baffles and help to make the cabinet sturdier. Of course, there are alternatives to this system, such as using separate cabinets. This is one of the advantages of building in modular form. I prefer to have everything in one cabinet, except the power supply, which I usually build in an identical unit.

The power supply should be very well-filtered and regulated to avoid stability and hum problems (see Fig. 11). A 12-volt battery will also make a suitable supply.

As you can see from Photo B, the gain control is to the right of the tuning knob and the mode switch is to the left. Later on, I added the attenuator switch, SW1 of the receiver module, above the gain control. At the rear, just below the hole for the sidetone, I installed the antenna connector, and I installed the speaker jack at the other side.

Tests and Operation

Once you get everything assembled and connected, calibrate the vfo so it covers the

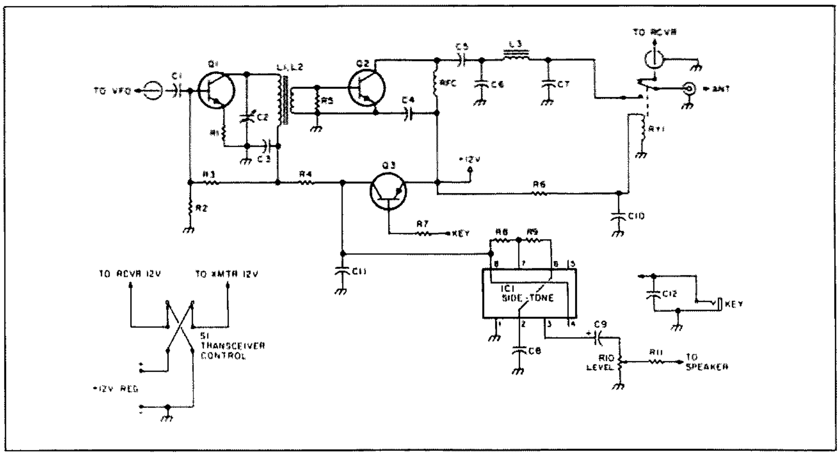


Fig. 8. Transmitter module schematic.

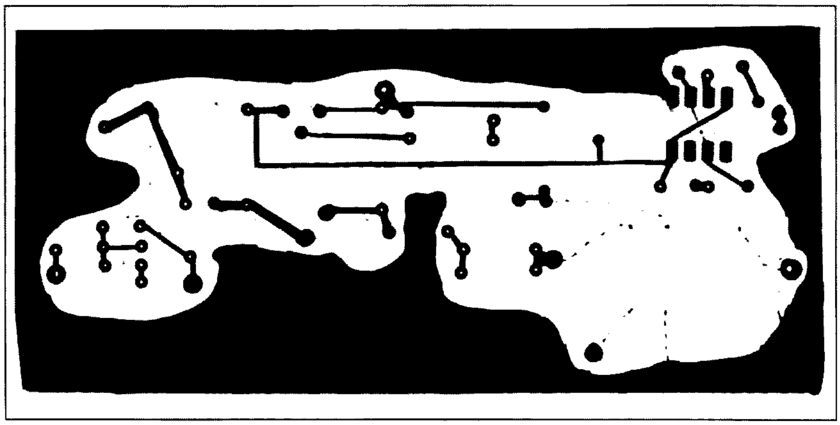


Fig. 9. Transmitter module, foil side.

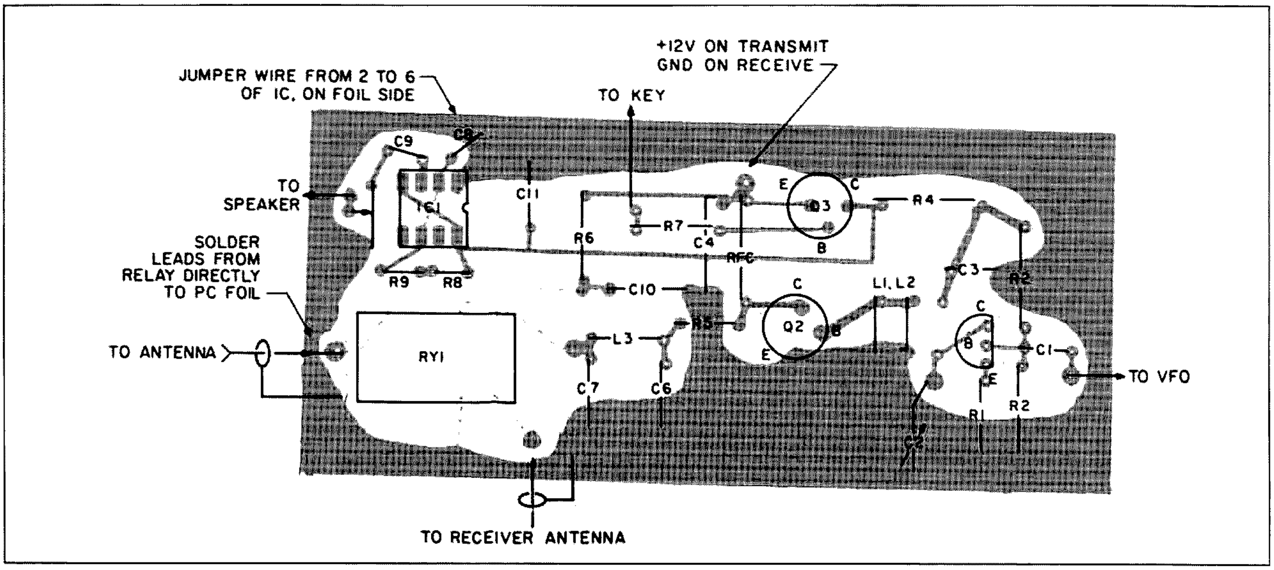


Fig. 10. Transmitter module, component side.

desired 100-kHz segment. With the vfo capacitor fully meshed, adjust the coil slug to obtain the low frequency limit, then set the capacitor at minimum capacity (dial at 100) and adjust the trimmer (C1). This procedure may have to be repeated a couple of times.

Your dial reading should track quite close to the frequency. I set mine to track from 7.0 to 7.1 MHz, and it holds true within a couple of kHz. If you want to set it for the Novice band, set the low end at 7.1 MHz and the high end at 7.2 MHz.

Next you should adjust the front end of the receiver. Set the dial to its midpoint and adjust the slug of the receiver for maximum signal from a generator or station. Of course, if you use a toroid front end, adjust the corresponding trimmer. No further adjustments are required for the receiver, unless you change segments later on.

To adjust the transmitter, first connect the set to a dummy load. A 47-Ohm, 2-Watt resistor will make a suitable one. A sensitive voltmeter with an rf probe is very useful during this adjustment. Turn the mode switch to transmit and close the key. Adjust C2 to resonance while measuring the rf voltage at the base of the output transistor; it should peak at around 1 or 1.5 volts. This adjustment will hold for the whole segment if it's done at the midpoint as the receiver was. Now you can check the voltage (rf rms) across the

Vfo Module Parts List

C1	10-pF miniature ceramic or air trimmer
C2	150-pF polystyrene or dipped mica
C3	20-pF polystyrene or dipped mica
C4	100-pF variable capacitor, semi-circular plates
C5	.1-uF, 50-volt ceramic
C6	.01-uF, 50-volt ceramic
C7	.1-uF, 50-volt ceramic
D1	1N914 diode
D2	6.2-volt, 1-W zener
R1	100k Ohms, 1/2 W
R2	220 Ohms, 1/2 W
R3	100 Ohms, 1/2 W
R4, R7	10k Ohms, 1/2 W
R5	1k Ohms, 1/2 W
R6	2.2k Ohms, 1/2 W
R8	330 Ohms, 1/2 W
Q1	2N3819 FET (MPF 102 can be used, modifying PC board for proper pin connections.)
Q2, Q3	2N3904 or 2N2222
L1	19 turns #26 enamel wire, close wound on a 1/4-inch slug-tuned plastic or ceramic form. Tap at 5-1/2 turns from ground. See vfo schematic for offset circuit values.

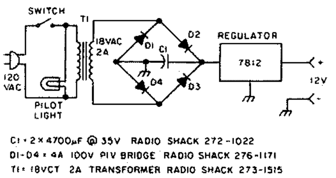


Fig. 11. Ac power supply schematic.

Transmitter Module Parts List

C1, C8, C10, C11	.01-uF, 50-volt disc ceramic
C2	150-pF ceramic trimmer, RS 272-1339
C3, C4, C12	.1-uF, 50-volt disc ceramic
C5	.05-uF, 50-volt disc ceramic
C6, C7	470-pF, 50-volt disc ceramic
C9	4.7-uF, 16-volt electrolytic
R1	47 Ohms, 1/2 W
R2	220 Ohms, 1/2 W
R3, R7	2.2k Ohms, 1/2 W
R4	100 Ohms, 1/2 W
R5	39 Ohms, 1/2 W
R6	470 Ohms, 1/2 W
R8	10k Ohms, 1/2 W
R9	100k Ohms, 1/2 W
R10	500-Ohm PC trimmer pot, RS 271-226
R11	100 Ohms, 1/2 Watt, not on circuit boards (Connect between sidetone and speaker to avoid shorting receiver audio.)
IC1	NE 555 timer chip
RY1	SPDT 6–8-volt miniature relay, RS 275-004 or similar
L1	30 turns #30 wire on a T-37-2 toroid
L2	4 turns #26 wire over ground end of L1
Q1	2N2222 or similar NPN transistor
Q2	2N3866 or equivalent 5-Watt HF transistor
Q3	2N3906 or similar PNP switching transistor
L3	16 turns #22 wire on a T-37-2 toroid

All inductors use enamel wire.

Receiver Module Parts List

C1	160-pF mica or polystyrene (or 150-pF trimmer, RS 272-1339 if using toroid inductor)
C2	.05 ceramic, 50 volts
C3, C5, C11	.01 ceramic, 50 volts
C4	4.7-uF, 16-volt tantalum, connect on foil side
C6, C15	.05 ceramic, 50 volts
C7	10-uF, 16-volt electrolytic or tantalum
C8, C14	22-uF, 16-volt electrolytic
C9	10-uF, 16-volt electrolytic
C10	4.7-uF, 16-volt tantalum
C12	100-uF, 35-volt electrolytic
C13	10-uF, 16-volt electrolytic
C14	22-uF, 16-volt electrolytic
C16	220-uF, 16-volt electrolytic
C17	.1 ceramic, 50 volts
C18	22-uF, 16-volt electrolytic
R1, R2	4.7k Ohms, 1/2 W
R3, R9	100 Ohms, 1/2 W
R4	100k Ohms, 1/2 W
R5	220 Ohms, 1/2 W
R6	1k Ohms, 1/2 W
R7	470 Ohms, 1/2 W
R8	10k Ohms, 1/2 W
R10	1.5k Ohms, 1/2 W
R11	10 Ohms, 1/2 W
R12	10k Ohms, 1/2 W
R13	22 Ohms, 1/2 W (If blocking and cross-modulation problems persist, try 10 Ohms.)
T1	Miniature audio transformer, 1k-Ohm primary CT, 8-Ohm sec., RS 273-1380
IC1	RCA CA-3028 differential amplifier IC
IC2	LM-386 400-mW amplifier IC
Q1	2N3904 or 2N2222 transistor
L1	18 turns close-wound #26 wire on 1/4-inch slug-tuned plastic or ceramic form, tap at 9 turns from low end
L2	2 turns #26 over low end of L1
L1	Alternate, 28 turns of #30 on T-37-2 toroid with tap at 13 turns from low end
L2	3 turns #26 over low end of L1

dummy load; it should be around 7 to 7.5 volts, indicating that you are getting a hefty 1-Watt output or slightly more.

There is one final adjustment that you should do—the vfo offset. I found that the easiest way to do this is to listen to the vfo signal on a separate receiver, then adjust the 5-pF trimmer so that on receive the frequency will be about 1 kHz lower than on transmit.

Operating Notes

When operating this little rig, you should consider a few things. Since the receiver will receive on either side of zero beat, it is necessary to listen on the high side (upper sideband). The transmit frequency will adjust automatically to that side because of the offset adjustment mentioned before.

Also, remember that you are operating with only 1 Watt, so try to work stations with loud signals. Weak ones may not hear you through the noise and QRM.

It is important to have a good resonant antenna system to obtain good results. I have worked many stations with my ground-mounted vertical and a transmatch adjusted to 1:1 swr. With ungrounded systems, hum may develop in the receiver, so a good separate ground is indispensible. With my antenna system, I have found that an additional ground connection is not necessary.

There is no reason why this transceiver could not be used on other frequencies by using the appropriate tuned circuits, but I have not tried this yet. I am working on a higher power transmitter idea. If you do the same thing before I do, won't you let me know about it?■

References

Solid State Design for the Radio Amateur, ARRL.

"A 20-Meter High-Performance Receiver," Rusgrove, *QST*, April, 1978.

The ARRL Handbook for the Radio Amateur, 1986.

"A 75-meter monoband transceiver," Littlefield, *Ham Radio*, November, 1985.

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C-64 Slow Scan

A picture is worth a thousand words.

Have you had to turn the page on articles about receiving SSTV and FAX because they were written for a TRS-80 and you have a Commodore 64? If so, this project is for you.

After reading such a set of articles by K6AEP (*73*, November and December, 1984), I corresponded with the author, only to discover that no information was available on how to use his interface with the C-64. The solution? I decided to create my own. First I obtained a board from L. W. Interface (9570 Kingsman Road, Novelty OH 44072). Then I wrote several assembly-language routines and prepared a hardware interface for the C-64. When possible, I used proven, available hardware designs, such as the KA4IWG SSTV interface.

Hardware

Fig. 1 details the interface circuitry. The C-64 expansion port is not buffered. However, the need for a three-state data bus and the use of a card cage remote from the C-64 indicate the need for external buffering. Consequently, I prepared a buffer card that plugs into the expansion port and connects to the card cage with 18" of multi-conductor ribbon. Components are surface-mounted in each side of the double-sided board and lines D0–D7 are run through a 74LS245, a bi-directional three-state buffer.

Another data buffer is already on the video display board, and a third is used to buffer the output of the ADC. Address lines A0–A2 are buffered by a 74LS541 set up to write only. External devices do not address the C-64. The fourth address line, buffered by a section of 74LS08, comes from pins 7 and 10 of the C-64. These lines go low when the respective expansion port section, I/O1 or I/O2, is accessed. I/O1 begins at address 56832, and I/O2 begins at 57088.

The enable signal called for by the K6AEP board is the phase 2 clock signal from the C-64. The R/W signal is self-explanatory. Both signals are buffered by 74LS08 sections. Construct a +5-volt 3-Amp supply to power the video display and other boards. Do not attempt to power the K6AEP board from the C-64 power

Address	Function
57000	6845 pointer register
57001	6845 control registers (R0–R13)
57003	Read data from ADC
57004	Reset video display card by addressing port
57005	Load data to video display card
56577	User port (sync detection)
56579	User port data direction register (load "0" for receive)

Table 1. C-64 port addresses used to send and receive.

Key	Function
S	8.5-second format
M	12-second format
L	16-second format
E	36-second format
D	Double top half of picture to fill entire screen
1	Expand upper left quadrant
2	Expand upper right quadrant
3	Expand lower left quadrant
4	Expand lower right quadrant
5	Expand control area
F1	Receive (press after selecting time of transmission)
F3	Place C-64 memory contents on screen
F5	Clear C-64 and screen
INST/DEL	Abort (press during transmission)

Table 2. Special function keys.

Pin	Connection
A	Ground
E	02 clock (enable)
W	A2
X	A1
Y	A0
Z	Ground
1	Ground
2, 3	+5 from C-64
5	R/W
7	I/O1
10	I/O2
14	D7
15	D6
16	D5
17	D4
18	D3
19	D2
20	D1
21	D0
22	Ground

Table 3. Commodore 64 expansion port pin locations.

Pin	Connection
1	Ground
2	+5
10	9 V ac
11	9 V ac
12	Ground
A	Ground
C	PB0
N	Ground

Table 4. Pin connections from the C-64 user port.

supply, which has a limited capacity.

Two additional hardware changes were made. The C-64 analog/digital converter operates so slowly that an external chip was added to speed up the process. The ADC0804 is part of the KA4IWG SSTV interface and works fine in free-running mode. It is allowed to access the three-state data bus by bringing pin 12 low on U14, a 74LS138 on the K6AEP board. That pin is wired to the data buffer on the ADC board.

A connector was obtained for the C-64 user

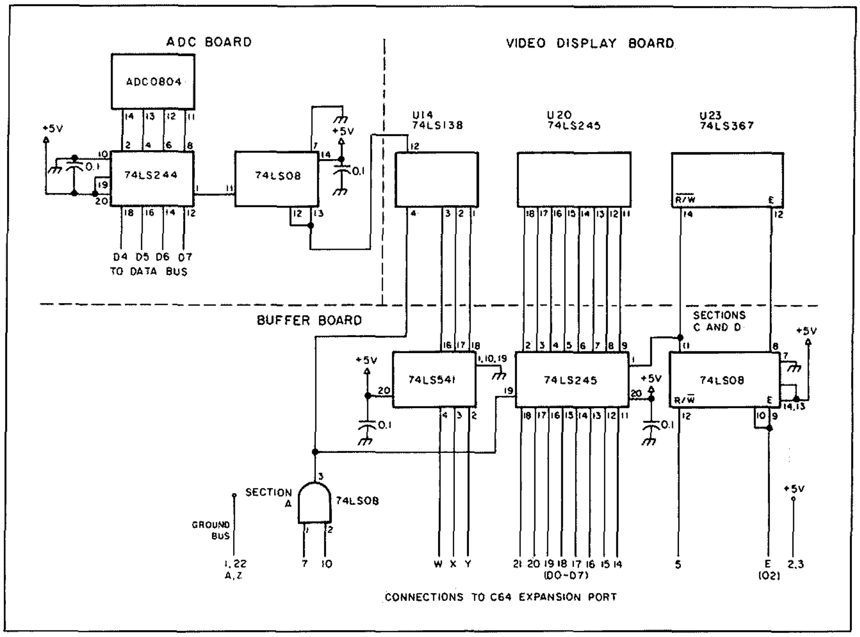

Fig. 1. Interface circuitry.

```
2 *= $C000
3 ; "INITIALIZE"
4 .MH
6 ;
8 .O
9 .D SLOSCAN
10 PORTA = 57000
11 PORTB = 57001
12 PORTC = 57003
16 PORTD = 57004
18 PORTE = 57005
20 PORTF = 56577
22 PORTG = 56579
23 MEMC = 323
24 MEMD = 324
25 LDA #0
26 STA 53265
60 LDA #00
61 STA PORTA
62 LDA #191
63 STA PORTB
64 LDA #$01
65 STA PORTA
66 LDA #128
67 STA PORTB
68 LDA #2
69 STA PORTA
70 LDA #$92
71 STA PORTB
72 LDA #3
73 STA PORTA
74 LDA #1E
75 STA PORTB
76 LDA #4
77 STA PORTA
78 LDA $78
79 STA PORTB
80 LDA #5
81 STA PORTA
82 LDA #35
83 STA PORTB
84 LDA #6
85 STA PORTA
86 LDA #119
87 STA PORTB
88 LDA #7
89 STA PORTA
90 LDA #$01
91 STA PORTB
92 LDA #8
93 STA PORTA
94 LDA #1
95 STA PORTB
96 LDA #9
97 STA PORTA
98 LDA #1
99 STA PORTB
100 LDA #10
101 STA PORTA
102 LDA #0
103 STA PORTB
104 LDA #11
105 STA PORTA
106 LDA #0
107 STA PORTB
108 LDA #12
109 STA PORTA
110 LDA #0
111 STA PORTB
112 LDA #13
113 STA PORTA
114 LDA #0
115 STA PORTB
116 LDA #14
117 STA PORTA
118 LDA #0
119 STA PORTB
120 LDA #15
121 STA PORTA
122 LDA #0
123 STA PORTB
124 LDA #16
125 STA PORTA
126 LDA #0
127 STA PORTB
128 STA PORTG
137 JMP WAIT
138 .FILE RECEIVE
```

Program listing 1. The initialize routine initializes the 6845 chip, then jumps to the control routine and waits in a loop.

```
9 ; "CONTROL"
10 WAIT LDA #$20
11 STA 252
12 LDA #0
13 STA 251
14 STA PORTD
15 LDA #128
16 STA 253
17 LDA #240
18 STA 254
20 WATE LDA 197
21 CMP #13
22 BNE NXA
23 JMP SHORT
24 NXA CMP #36
25 BNE NXB
26 JMP MEDIUM
27 NXB CMP #42
28 BNE NXC
29 JMP LONG
32 NXC CMP #14
33 BNE NXD
34 JMP EXTL
35 NXD CMP #4
36 BNE NXE
37 JMP VSYNC
38 NXE CMP #5
39 BNE NXF
40 JMP MOVE
41 NXF CMP #6
44 BNE NXG
45 JMP CLEAR
46 NXG CMP #18
47 BNE NXJ
48 JMP HRT
52 NXJ CMP #56
53 BNE NXZ
54 JMP MAP
55 NXZ CMP #59
56 BNE NXY
57 JMP MBP
58 NXY CMP #8
59 BNE NXW
60 JMP MCP
61 NXW CMP #11
62 BNE NXV
63 JMP MDP
64 NXV CMP #16
65 BNE WJC
66 JMP MEP
167 WJC JMP WATE
173 SHORT LDA #43
174 STA MEMC
175 LDA #37
176 STA MEMD
177 JMP WATE
178 MEDIUM LDA #50
179 STA MEMC
180 LDA #44
181 STA MEMD
182 JMP WATE
200 LONG LDA #56
201 STA MEMC
202 LDA #50
203 STA MEMD
204 JMP WATE
205 EXTL LDA #70
206 STA MEMC
207 LDA #64
208 STA MEMD
209 JMP WATE
213 MAP LDA #0
214 STA 251
215 LDA #$20
216 STA 252
217 JMP VRT
220 MBP LDA #$20
221 STA 252
222 LDA #$40
223 STA 251
224 JMP VRT
230 MCP LDA #0
231 STA 251
232 LDA #$60
233 STA 252
234 JMP VRT
240 MDP LDA #$60
241 STA 252
242 LDA #$40
243 STA 251
244 JMP VRT
250 MEP LDA #$40
251 STA 252
252 LDA #$20
253 STA 251
254 JMP VRT
255 .FILE HORIZS
```

Program listing 2. The control routine is a wait loop. It initializes the counters, then waits until an option is selected and jumps to that option.

```
1 ; "RECEIVE"
2 RCVC LDX MEMD
3 NOP
4 RCVA LDX MEMD
5 OWT DEX
6 BNE OWT
14 RCVB LDA PORTC
16 LSR
17 LSR
18 LSR
19 LSR
20 STA 2
32 LDX MEMC
33 ONE DEX
34 BNE ONE
35 LDA PORTC
36 AND #240
37 ORA 2
38 STA (251),Y
39 STA PORTE
40 DEC 253
41 BNE ALF
42 JMP HSYNC
43 ALF INC 251
44 BNE RCVC
46 INC 252
47 JMP RCVA
48 .FILE CENTRAL
```

Program listing 3. The receive routine gets four bits at a time from the ADC and loads a byte both into the C-64's memory and onto the video board.

```
10 ; "HORIZS"
12 MOVE LDX #$A0
14 STA PORTD
20 TREE LDA (251),Y
22 STA PORTE
23 INC 251
24 BNE TREE
25 INC 252
26 CPX 252
27 BNE TREE
28 MUP LDA 197
29 CMP #64
30 BNE MUP
31 JMP WAIT
32 CLEAR LDX #$A0
33 LDA #$18
34 STA 252
35 LDA #0
36 STA 251
37 TAY
38 STA PORTD
39 LDA #255
40 MORE STA (251),Y
41 STA PORTE
42 INC 251
43 BNE MORE
44 INC 252
45 CPX 252
46 BNE MORE
47 JMP WAIT
55 HSYNC LDA PORTF
56 AND #1
57 BNE THREE
60 CPY 197
61 BNE HSYNC
62 JMP WAIT
63 THREE LDA PORTF
64 AND #1
65 BNE THREE
66 LDA #128
67 STA 253
68 DEC 254
69 BEQ OUT
70 JMP ALF
71 OUT JMP WAIT
72 .FILE VERTS
```

Program listing 4. This routine detects the horizontal sync (H sync), and also reloads the C-64's memory to the display board (move) and clears the screen and memory (clear).

port to permit interface to the SSTV converter. The "horizontal" line from the converter board carries both vertical and horizontal sync to PB0 of the user port where it is detected by software.

The K6AEP board itself required only that a wire be run from pin 12 of U14 to one of the unused contacts on the board. This permits U14 to select the ADC. Also, a 7400 was substituted for the 74LS00 U19 to provide better oscillator starting.

Software

Table 1 sets forth the port addresses used to send and receive by the C-64. These are all in the I/O1 section.

The video display board (here a 32K board from L. W. Interface) must be initialized before operation can begin. Port 57000 selects the pointer register of the 6845 video display chip. Port 57001 sends data to the control register. The values are by and large those set forth by K6AEP.

The user port data direction register is loaded with a "0" (zero) to set the port to receive, the port being at 56577. Location 53265 is loaded with a zero to shut down the C-64 display (Vic II chip) and prevent bus contention. Location 57004 resets the memory position counters on the display board. The data content is irrelevant. Merely addressing that port causes the reset.

The software routines build on ideas provided in other sources (see the references listed at the end of this article). Vertical sync is detected by the time duration of the signal, about 60 ms, as opposed to 5 ms for the horizontal sync pulse.

The program then passes to the receive function. This program uses four bits per pixel and 120 lines of video. The 8.5-, 12-, and 16-second formats fill only one-half of the screen; the 36-second format fills the whole screen.

Table 2 explains the special function keys. Receive is selected by first pressing a key for length of picture, then pressing F1. The routine may be aborted by pressing INST/DEL. In the event that the abort doesn't work, hit RUN/STOP and RESTORE, then CLEAR/HOME-SHIFT. Then reenter the program by typing SYS 49152 and pressing the return key, which is the same way the program is started.

Once a picture is displayed, F3 will clarify the picture should the image on the screen differ from what is in memory. F5 will clear memory and display. Quarter frames may be expanded by hitting digits 1–5. Pressing "D" will cause the half-size picture from an 8-, 12-, or 16-second format to fill the whole screen.

Conclusion

The K6AEP circuit with an SSTV converter and ADC board works nicely with the

```
10 ; "VERTS"
12 VSYNC LDA PORTF
14 AND #1
16 BEQ VSYNC
18 JSR SYNCNT
20 LDA PORTF
22 AND #1
24 BEQ VSYNC
26 FIVE LDA PORTF
28 AND #1
29 BNE FIVE
34 JMP RCVA
60 SYNCNT LDA #243
62 STA 820
63 STA 821
64 STA 822
65 NON DEC 820
66 DEC 821
67 DEC 822
68 BNE NON
70 RTS
71 .FILE EXPAND
```

Program listing 5. The vertical sync detection routine.

```
10 ; "EXPAND"
20 VRT LDA #$03
21 STA 254
22 LDA #$3C
23 STA 253
24 LDA #120
25 STA 1020
26 NTQ LDX #64
30 NTD LDA (251),Y
31 STA PORTE
32 STA PORTE
33 STA (253),Y
34 INC 253
35 STA (253),Y
36 INC 253
37 DEX
38 BNE NTY
39 JSR NTT
50 DEC 1020
51 BNE NTR
52 JMP WAIT
53 NTR LDX #64
54 NTA INC 251
55 BNE NTB
56 INC 252
57 NTB DEX
58 BNE NTA
59 LDA #$3C
60 STA 253
61 LDX #64
62 NTY INC 251
63 BNE NTZ
64 INC 252
65 NTZ JMP NTD
66 NTT LDX #128
67 LDA #$3C
68 STA 253
69 NTS LDA (253),Y
70 STA PORTE
71 INC 253
72 DEX
73 BNE NTS
74 RTS
75 .FILE EXTEND
```

Program listing 6. The expand routine expands the selected quarter frame to fill the entire screen.

```
10 ; "EXTEND"
20 HRT LDA #$03
21 STA 254
22 LDA #$3C
23 STA 253
24 LDA #120
25 STA 1020
26 HTQ LDX #128
30 HTD LDA (251),Y
31 STA PORTE
33 STA (253),Y
34 INC 253
37 DEX
38 BNE HTY
39 JSR HTT
50 DEC 1020
51 BNE HTR
52 JMP WAIT
59 HTR LDA #$3C
60 STA 253
61 LDX #128
62 HTY INC 251
63 BNE HTZ
64 INC 252
65 HTZ JMP HTD
66 HTT LDX #128
67 LDA #$3C
68 STA 253
69 HTS LDA (253),Y
70 STA PORTE
71 INC 253
72 DEX
73 BNE HTS
74 RTS
75 .END INITIALIZE
```

Program listing 7. The extend routine expands the selected half screen (8, 12, 16 second) to fill the entire screen.

C-64. The software is offered as a springboard for experimentation; further software development is possible to include perhaps a noise-cancelling feature and color and WEFAX for those who have an appropriately equipped station.

The program, incidentally, was constructed by assembly with a LADS assembler.[3] Don't be put off by the need for assembly language. It's easier than Basic in some respects and a good book will get you started. I found *Assembly Language Programming with the Commodore 64* by Marvin DeJong to be excellent. I would be happy to hear from those who carry out this experiment. ■

References

1. "Color Computer SSTV," Clayton W. Abrams K6AEP and Dr. Ralph Taggart, *73*, November and December, 1984.
2. "Color SSTV and the Atari Computer," Martin F. Shick KA4IWG, *QST*, August, 1985.
3. *Compute!* Publications, PO Box 5406, Greensboro NC 27403.
4. *Assembly Language Programming with the Commodore 64*, Marvin DeJong, Brady Communications Co., Inc., Bowie MD 20715.
5. *Commodore 64 Interfacing Blue Book*, V. J. Georgiou, Micro Signal Press, PO Box 22, Millwood NY 10546 (1984).
6. MC6845 Data Sheet, Motorola Semiconductor Products, 3501 Ed Blustein Blvd., Austin TX 78721.
7. *CRT Controller Handbook*, Gerry Kane, Osborne/McGraw Hill, Berkley CA (1980).

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The Calibrated Drake

If you've got a Drake 2-line, you'll need this simple calibrator to avoid FCC pink slips.

Number 3 on your Feedback card

On a number of occasions, I've owned various Drake radios. The R4–T4 series, as well as the 2As, 2Bs, and 2Cs, have passed through my hands. Each time I've sold a "2" series receiver at a hamfest, I've been barraged by amateurs who have asked if I would be willing to sell just the 2AC calibrator. Apparently, when most of the "2" series receivers were purchased, the plug-in crystal calibrators (2AC) were not. And now that the receiver is no longer in production, the calibrator is not available either.

It has been several years since I've owned a Drake 2C, but I recently spotted a very clean one at a hamfest and thought I might pick it up as a backup receiver. Unfortunately, the receiver lacked the 2AC calibrator unit.

Since my chances of finding one of the original calibrator units were slim, the next best thing was to build one. The handbooks were full of various designs for calibration marker units, but the designs were all state-of-the-art, utilized ICs, and, therefore, were more sophisticated than was really necessary. Further searching through the manuals revealed a tube-type crystal calibrator circuit designed by Swan Electronics Corp. (now Cubic Communications) for use with their earlier model 350C. With a few minor changes, the circuit was adapted for use in my Drake 2C.

The Circuit

The original circuit (see Fig. 1) called for a 12BA6 pentode in a modified Pierce crystal oscillator circuit, and it was turned on and off with a push/pull switch, which either grounded the cathode (completing the circuit) or un-grounded it (removing the B-return and opening the circuit). The Drake circuitry, on the other hand, switched the B+ line to the plate and screen when the front-panel switch was placed in the calibrate position.

> ***"This calibrator should work well with almost any tube-type receiver or transceiver capable of supplying the appropriate filament voltage."***

Most of the circuitry I used was identical to that used by Swan except that I substituted a 6BA6 for the 12BA6, so that the filament voltage would be compatible with my 2C, and the cathode was grounded directly to a grounding lug. I did not have the exact components in my junk box to duplicate the rest of the Swan circuit, but I found that the values of most of the components were not critical. The actual value of C1 may vary slightly as indicated in the parts list due to varying crystal capacitance.

I did make one other addition to the circuitry, and that was the placement of a 1N34 germanium crystal diode in series with the output. This diode provides a square-wave output (rich in harmonics) to allow for a higher calibrate level at frequencies above 7 MHz, where the calibrate level was especially low using the original circuitry. Fig. 2

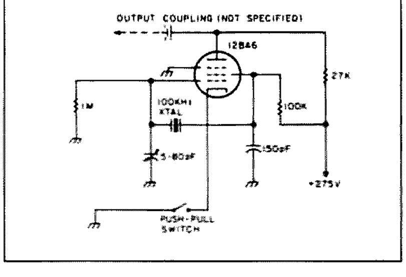


Fig. 1. Original Swan circuit. Source: Operation and Maintenance: Swan 350, *Swan Electronics Corp.*

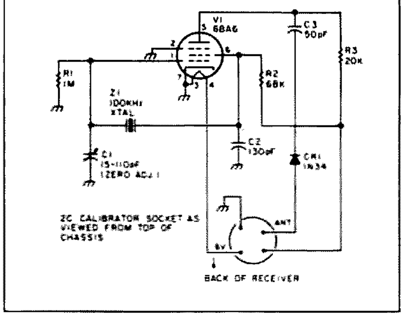


Fig. 2. Calibrator circuit modified for the Drake 2C.

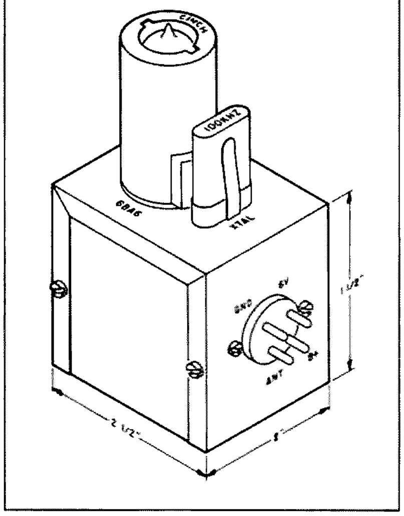


Fig. 3. General layout of the calibrator.

illustrates the final schematic diagram after changes.

Construction

The calibrator could have been included right on the 2C chassis. But not wanting to "spoil" the appearance or resale value of the receiver, I decided to make my calibrator a plug-in unit like the 2AC. The calibrator is housed in a homemade minibox that measures 2-1/2" long by 2" wide by 1-1/2" deep. The placement of components is such that when the unit is plugged into the calibrator socket on the 2C's chassis top, the 6BA6 tube is above the 100-kHz crystal and should not cause adverse frequency drift during operation. When the unit is plugged in, a window at the top allows for adjustment of the frequency zero-adjust capacitor if you use a small screwdriver.

The parts placement is not critical except for the location of the crystal in relation to the 6BA6 tube as previously mentioned, and lead lengths should be kept as short as possible in the plate and grid circuitry. Fig. 3 illustrates the location of the major components.

Alignment

The alignment procedure is relatively simple if you have a crystal to cover the 10-MHz WWV range. With the completed calibrator plugged into its appropriate socket, turn the radio on, make sure that the 6BA6 filament is lit, and allow at least 20 minutes of warm-up time for the receiver to stabilize itself. Switch over to AUX crystal position to allow for use of a 14-MHz heterodyne oscillator crystal so that you can tune the 10-MHz band. Find station WWV with the MODE switched to AM (bfo off). Switch the function switch to CAL; you should hear the oscillator heterodyne beating against WWV. Adjust the ZERO capacitor on the plug-in calibrator unit until you hear a null (zero beat). At this point, your calibrator is calibrated with WWV and should provide a reasonably accurate frequency standard.

Although this calibrator was designed for the Swan 350 and adapted for the Drake 2C, it should work well with almost any tube-type receiver or transceiver capable of supplying the appropriate filament voltage (6 volts for 6BA6 or 12 volts for 12BA6) and between 150 and 250 V dc. ■

Parts List

C1	15–110-pF or 5–80-pF mica compression trimmer (see text)
C2	130-pF silver mica or polystyrene capacitor, 300 WV dc
C3	50-pF silver mica or disc ceramic capacitor, 300 WV dc (Increase the value for greater coupling.)
CR1	1N34 germanium diode or equivalent
R1	1-megohm, 1/4-to-1/2-Watt carbon resistor
R2	68–100k, 1/2-Watt carbon resistor
R3	20–27k, 1/2-Watt carbon resistor
V1	6BA6 7-pin miniature vacuum tube
Z1	100-kHz quartz crystal
Miscellaneous Parts	
1	2-1/2" x 2" x 1-1/2" aluminum minibox
1	7-pin miniature tube socket with cover
1	4-pin plug to mate with 2C calibrator socket
1	Crystal socket for .050 pins (HC-6 type)

Trimmer capacitor mounting bracket, grounding lugs, mounting hardware, hookup wire, and solder (60-40)

References

Byron Goodman W1DX, Editor, *The Radio Amateur's Handbook*, ARRL (1967).

Operation and Maintenance: Swan 350, Swan Electronic Corp., Oceanside CA (1967).

W. S. Gardiner VE6BGL
Box 2035
High River, Alberta
Canada T0L 1B0

The Cap Checker

Haul out your junk box and build VE6BGL's simple analog capacitance meter.

Number 4 on your Feedback card

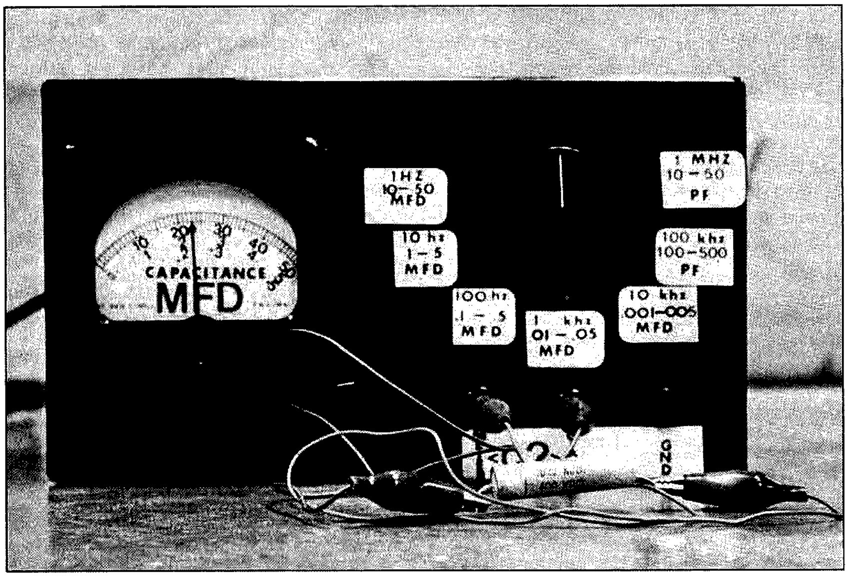


Photo A. VE6BGL's 1-pF-50-uF capacitance meter.

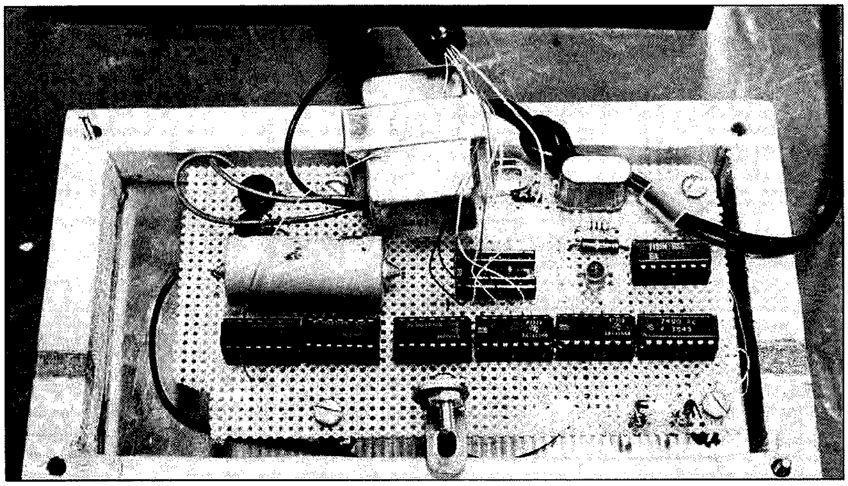


Photo B. Interior view.

The Jr./Sr. High School electronics students that I teach spend quite a bit of time cannibalizing consumer/industrial electronic equipment for parts. The kids get a good idea of how electronic devices are built and we also have a large communal supply of parts "on the hoof."

After a part has been removed, it is tested using an ohmmeter or transistor checker. Until now we didn't have a simple method of checking out capacitors. I did a survey of available commercial meters and found that most were digital and expensive. For student use I wanted something cheap, durable, and easy to fix. Necessity being the mother of invention, I came up with my own inexpensive analog capacitance meter.

After perusing several articles on the subject, I saw that all one needs is some sort of variable pulse generator and a meter circuit to measure the amount of voltage "leaking through" the capacitor. This amount would be a function of the frequency used and is basically capacitive resistance (I remembered that from the Advanced exam).

Construction

The junk box produced a piece of perfboard complete with a couple of crystals and wire-wrap sockets. I recently discovered wire-wrap—it is fast, easy, and highly recommended. The whole project was wire-wrapped in 90 minutes, and it beats the heck out of etching circuit boards.

With the exception of the crystal, all of the parts should be readily available. To generate the pulses, I first used a 7404 hex inverter as a 1-MHz oscillator and then successive 7490 decade divider chips to divide the frequency down to 1 Hz. There is nothing sacred about the frequency of the crystal—it was what I had on hand. It would be fairly easy to use a 2-, 3-, 5-, or 10-MHz crystal and divide it in a similar fashion to get the same result.

I used a surplus 1-mA meter movement and carefully removed it from its case in order to redo the scales with press-on transfer lettering. The remaining 7404 inverters were put in parallel and were used to drive an LED, which blinks on and off at 1 Hz and gives you a good idea if the thing is working or not. My LED is still mounted on the perfboard but will soon be on the front panel.

Power for the beast comes from a surplus transformer, two diodes, a 7805 regulator, and a 500-uF capacitor. This is your basic 5-volt power supply, and you can build it with whatever you happen to have available. Use the low-power version of the 7490s if you have them, as battery power might then be possible.

To use the meter, set the switch to the highest range (1 MHz) and connect the unknown capacitor across the clock output and the meter input jacks. Rotate the switch to the right lower range (this is the one before the meter goes "ping" on the stop) and read the value from the meter on the correct scale.

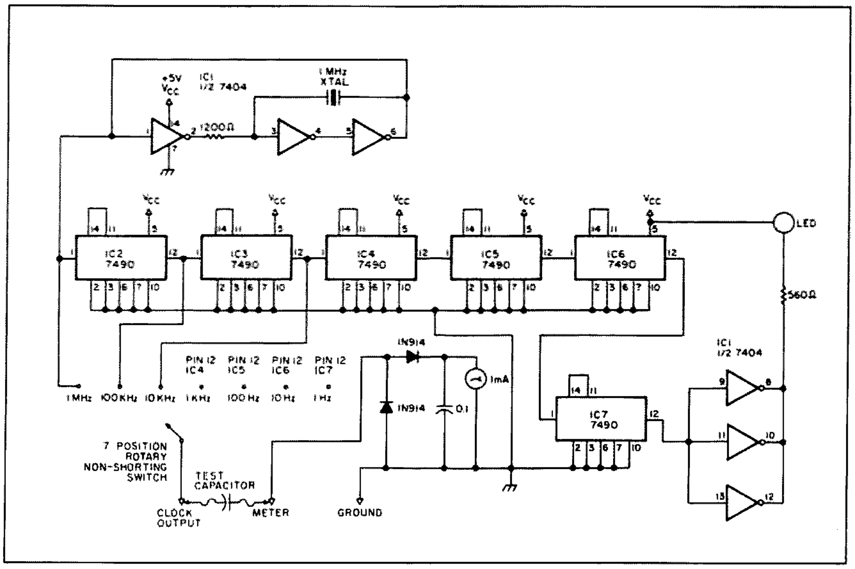


Fig. 1. Schematic of the capacitance meter.

Other Uses

If you have a spool of coaxial cable and need to know how much is left (without unrolling the entire spool), all you have to do is connect the cable to the meter, take a reading (in pF), and divide it by the manufacturer's spec for the cable (in pF/foot). The resulting quotient is the length of the cable in feet. The same method could be used to locate the position of a break in the cable. For example, a cable 100 feet long, with a capacitance of 5 pF/foot, should have a reading on the meter of 500 pF. If your meter reading is 200 pF, you know that there is a break in the cable 40 feet from the end where the meter is.

Another use appeared when I turned on the hand-held to answer a call on our local repeater. This gadget makes a dandy marker generator right up to 147.000 MHz and then some. For oscilloscope owners, it can also be used as a timebase generator to measure frequency by using Lissajous patterns.

I hope you enjoy this versatile piece of test gear. Get out there and build something again! ■

ANNOUNCING:

73 Magazine's DX Dynasty Award

One day not too long ago the staff of *73* was sitting at lunch over at The Folkway talking about DX and DXing and how crazy DXCC had gotten. The DXCC Honor Rollers have nothing left to work, and folks coming into the program have no hope of working countries that haven't been on the air for twenty years.

By the time we got around to coffee and mocha chip cake we had decided to start our own DX award. We wanted everybody to start with zero countries to liven things up a bit on the bands. Wayne suggested that we add to the ARRL's DXCC countries list by searching through the awards programs of IARU members. We decided to offer endorsements for every mode we could think of.

We want you to *have fun* with this award. The rules are simple, but the variety of levels and endorsements makes the award a challenge for both the beginner and the experienced DXer. We've come up with nearly 400 countries, so you'll not soon run out of things to work!

The Award

The basic award will be issued for 100 countries worked. Endorsements will be made for 150, 200, 250, 300, 350, 375, and 400 countries worked. The basic award is mixed-mode.

Special endorsements are available for single-band operation and for specific modes, including CW, SSB, satellite, Baudot RTTY, ASCII RTTY, AMTOR, packet, spread-spectrum, QRP (less than 5 Watts output), EME, FM, AM, FAX, and SSTV. Logs submitted for special endorsements must clearly indicate the band and mode used for all contacts.

The Rules

Effective Date: Only contacts made after 0001Z on January 1, 1987, will be eligible for the DXD Award.

Bands: Contacts may be made on any amateur band except 10 MHz. No cross-band contacts are allowed.

Modes: Any mode available to amateurs in your country may be used. Cross-mode contacts are allowed: The mode that *you* are using is what counts for the DXD Award.

Minimum report: There is no minimum signal report (you can't work 'em if you can't hear 'em).

Applications: QSL cards are not required for the DXD Award. Application must be made on an official DXD form, available from *73* Magazine—send an SASE to WGE Center, Peterborough NH 03458, Attn: DXDA. On the form, list your contacts in callsign order, indicating date, time, frequency or band, mode, and power. We may, on occasion, ask to see your log, so no funny business.

Fees: The fee for the basic award, due upon application, is U.S.$6. IRCs are not accepted. Each additional endorsement is U.S.$2. *Note: Endorsements requested on your first application are free.*

Country Criteria: Countries on the DXD Award list are taken from the awards programs of IARU member nations. If you come across a country not on the list that you feel should be included, send a copy of award rules from an IARU member which lists that country as being valid for an award to *73* Magazine for evaluation. New countries will be added as needed and announced in *73*.

Countries List: The DXD Award countries list will be printed from time to time in *73*. A copy of the current list (just under 400 countries, but still climbing) and an official application form are available from *73* Magazine, WGE Center, Peterborough NH 03458, Attn: DXDA.

Ready, Set...

Who will be the holder of DXDA #1? Who will be the first to hit the 300 country mark? Everyone has an equal shot at it, starting January 1st. We'll publish a list of DXD Award holders every month so that you can see how you are doing.

Excuse me. I see that it's 0001Z... CQ DX, CQ DX, CQ DX... ■

To receive a copy of the current DX Dynasty Award countries list and an official application form, send an SASE to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: DXDA. *73*'s DX Map of the World is available for $5 ppd.

WEATHERSAT

Number 28 on your Feedback card

Dr. Ralph E. Taggart WB8DOT
602 S. Jefferson
Mason MI 48854

EQUIPMENT EVALUATION

This month I want to take a look at three items of commercial equipment and hit a few news items. Before I look in detail at the equipment, a few words are in order about the mini-reviews you will see from time to time in this column.

Whenever possible, evaluations of equipment and software will be based on actual use, but they must also be unbiased. It is quite possible to negotiate all sorts of special prices on gear if you are going to review it in a column like this. Unfortunately, that is not the way to retain your objectivity since you feel obligated to the supplier in direct proportion to whatever discount or special consideration you were able to obtain.

Whenever you see items covered in this column, they will have been obtained in one of two ways. The first is by direct purchase, just like any other consumer. I will obviously shop for the best discount, but it will always be a "public" discount that anyone else could obtain by shopping at the same source.

The second approach is a direct loan of the gear for a period of a few weeks. In most cases, such equipment is returned when the evaluation is complete. If I can't live without it, I will purchase the gear at the standard rate and let you folks know. All this may seem a bit elaborate, but you have a right to know the conditions that might impact an evaluation.

GaAsFET Preamp

In my review of receiver options (November, 1986), I noted the versatility of some of the new wide frequency range scanners. The primary difficulty with such receivers is that they are almost impossible to modify internally, leaving you to use the wide bandwidth position (typically 100 kHz or more) for FM satellite reception.

In order to use such receivers effectively with omnidirectional polar-orbit antennas, some really low noise preamplification is required. GaAsFETs, with noise figures below 1 dB, are obvious candidates. Most two-meter GaAsFET amplifiers are quite expensive, so I was pleasantly surprised to note the Hamtronics ad (65-D Moul Road, Hilton NY 14468; 716-392-9430) in *73* which featured several two-meter units in the $35 to $80 range. I placed a phone COD order for one of their LNG-144 units ($49) and it arrived in just a few days.

This particular unit is mounted in a small plated metal case and has a claimed tuning range of 137–150 MHz, a noise figure of 0.7 dB, and about 18 dB of gain. The units come tuned for two meters (special tuning was not available), and the documentation notes that the amplifier is suitable for mast mounting and is easy to retune for other frequencies in the operating range. The amplifier is designed to operate from 12–14 V dc and features internal zener regulation that should make the power-supply regulation relatively uncritical.

First the nit-picking and then on to the good stuff! The unit is *not* easy to retune with equipment that most folks will have available. I have some excellent weak-signal sources, yet I was unable to find a real signal peak when the unit was retuned to 137.5 MHz. There are combinations of input and output tuning where the unit *will* oscillate (very obvious), but they are easily avoided. I suspect that the amplifier is quite broadbanded, and would suggest that you use it as set at the factory, at least initially.

Second, the unit is *not* suitable for mast mounting as it arrives from the factory. The little metal case is open at the bottom and will require a sealing plate when tuning is complete. I don't know how the plating will stand up to the weather, but the BNC connections and the dc tap will require weather sealing if they are directly exposed to the weather. A ventilated enclosure to keep the worst of the weather off the unit is probably a good idea.

Now the promised good stuff! The unit does deliver good gain, with a major reduction in the noise floor compared to the quiet JFET circuit I have been using. With the LNG amplifier in the line, the performance of my wideband scanner is now almost equal to the matched bandwidth receiver with the JFET amplifier in polar-orbit service; that is quite acceptable given the frequency agility of the scanner. With the LNG ahead of the matched bandwidth receiver, signals pop up to full quieting as soon as the spacecraft clears the horizon when I am using my omnidirectional Zapper antenna from the *WSH*.

A preamp like the LNG unit will *not* solve the problem of WEFAX reception using a wideband scanner. Most WEFAX downconverters employ a low-noise i-f preamp in the converter, and it is this device that sets the VHF noise figure. Those with a yen to experiment may want to look at hooking the LNG or similar amplifier *directly* to the output of the converter mixer—that may be enough of an improvement to let the system work at a wider bandwidth.

One factor that I am happily not in a position to evaluate is the effect of rf pollution on the performance of the LNG/wide-bandwidth-receiver combination, since I am located in a rural area. Wide frequency range scanners are subject to intermod and spurs, and it may be necessary at some locations to look at a helical resonator filter (Hamtronics has inexpensive units in their catalog).

If the scanner is the big contributor, installing such a filter between the amplifier and the scanner should help without noticeably degrading system performance. If the amplifier is contributing, which should be less common since GaAsFETs are hard to crunch, the filter will have to go up front and that will degrade the noise figure by the value of the filter insertion loss. Such a decrease is strictly relative, however, since you would probably face the same problem with any amplifier if your local rf density is enough to bother the GaAsFET!

The LNG-144 is certainly a good buy at the price, and there are several other models of similar performance that might be of interest. Hamtronics' LNW series (available in a 120–150-MHz version) is a small, unpackaged amp available as a kit for $19 or wired for $34. This unit is quite small and might be a good candidate for retrofitting into an existing WEFAX converter.

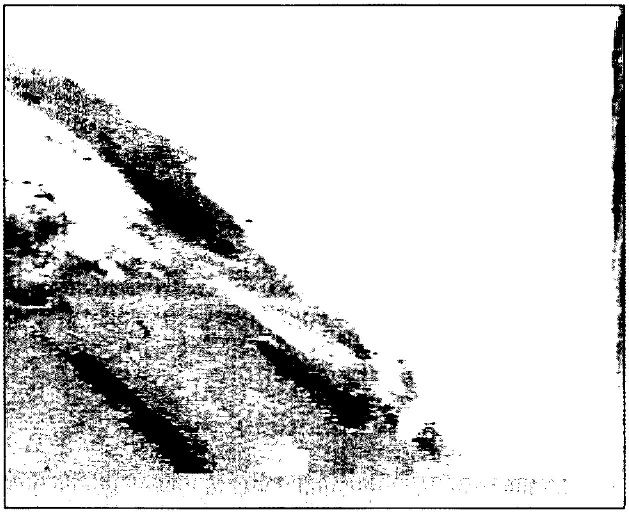


Photo A. GOES Central relay of a NE quadrant from the European METEOSAT spacecraft in IR. The original image was displayed on the WSH *scan converter and printed on the P-50U video printer. The Red Sea is visible in the lower left and the eastern end of the Mediterranean is just visible. Some readers have commented that they have trouble interpreting the features of the METEOSAT images carried on the GOES schedule. This is due to several factors including relatively lower contrast of METEOSAT IR imagery (the only ones we get!), the smaller geographic area covered by each quad, and the fact that the pictures are transmitted upside down!*

Scan Converter Hard Copy

Scan converters are unequaled in their operating versatility but have one major drawback—what do you do if you need a copy of a particularly interesting picture? Up to this point, the

hard-copy alternatives were limited to programming your system to print the image on a dot-matrix printer or photographing the display.

With all due respect to hard-working programmers (see next review), there is a limit to what can be accomplished using a dot-matrix printer and photographs. While they are of excellent quality, they also take time to obtain. One answer is the growing range of video printers that are becoming available to service the rapid growth in video-related fields.

All video printers are essentially special-purpose FAX machines. They contain a solid-state memory and grab and store a single frame of video from a camera, VCR, computer terminal, or, in our case, a scan converter. Once stored, the image is controlled by a built-in microprocessor and printed using, in most cases, thermal paper that is fed from a roll.

Mitsubishi Electric (800 Biermann Court, Mt. Prospect IL 60056-2173) has a growing line of video printers with a variety of capabilities as I discovered in a pleasant meeting with William Dulaney, Jr., their OEM/Industrial Video regional sales manager for my part of the world. Bill was kind enough to leave one of the P-50U printers for my evaluation, plus some literature on more advanced models.

The P-50U printer has been around for a few years now, and you may have seen one at the Robot booth in Dayton two years ago where it was constantly generating prints from their 450C and 1200C scan converters. The P-50U is a fairly compact box about 8.5 inches wide, 4.5 inches high, and a shade over 14 inches deep. Prints feed out of a slot in the front of the machine and operating controls are minimal. The resulting prints are about 4 inches wide and 3.25 inches high. The printer reproduces 16 grayscale shades and has a horizontal resolution of 280 picture elements per line and a vertical resolution of 234 lines. A single roll of the white thermal paper will print approximately 220 pictures at a cost of a few cents per print. List price for the P-50U is about $400.

Operationally, the P-50U is extremely easy to use. Interconnection to existing systems is quite simple. You run a video cable from your scan converter to the video input jack with another cable from the video output jack to the input of your monitor.

Three small front-panel pushbuttons control contrast (light, normal, and dark). There are two large front-panel pushbuttons for PRINT and COPY. If you have a picture you would like to save, you simply hit PRINT and the image feeds out the front slot. The literature says this takes 15 seconds. I timed it at 20, but the bottom line is that it doesn't take long! The COPY switch is used to make additional prints of the image in the P-50U memory even if the image on the display has changed.

Two additional controls on the front panel add to the unit's versatility: a P-FEED switch, which simply feeds the paper, and a PRINT switch (smaller than the main PRINT switch), which can be set for a positive (normal) or negative printout. There is also a scan switch with a normal and a reverse position that can be used to invert images.

The P-50U did deliver as promised, yielding prints from the output of the *WSH* scan converter without any fuss or bother. Two samples of typical prints, one of a METEOSAT frame and another of a GOES E SE quad (IR), are reproduced in Photos A and B.

Close examination of a number of prints, however, did indicate that the tonal resolution, as viewed on the monitor, was greater than that produced by the printer. The reason quickly became clear when the scan converter was used to generate a grayscale from which a print was obtained. The original grayscale had eight steps and was repeated twice for each line (two grayscale cycles per line).

"There is a limit to what can be accomplished using a dot-matrix printer and photographs."

Each step, from black on the left through white on the right, was clearly differentiated on the monitor but not on the printout (even after all levels into the P-50U had been optimized for best reproduction). Clipping or compression is evident at both ends of the grayscale. Step 1 (black) and step 2 appear as a single broad stripe. Similarly, step 8 (white) and the preceding step (7) are not resolved, but appear as a broad white stripe. The P-50U's sampling or best reproduction (I don't know which) is clearly centered around the middle of the dynamic range, missing fine gradations at the black and white ends.

The problem is a bit more serious than might at first be assumed, since the scan converter generates a total of 16 grayscale steps, with additional values intermediate between each of these values. In reality, at least four and possibly five of the total of 16 are missing in the P-50U reproduction!

The only remedy for this difficulty is to reduce the dynamic range of the video output to match the capabilities of the printer, but this results in a rather washed-out image compared with the crisp tones of the original. One of the big challenges in designing a scan converter like the *WSH* unit is to obtain good dynamic range on the output video while still maintaining solid sync. Having achieved that, it hardly makes sense to throw it away just to keep the printer happy! While the prints lack the crispness and dynamic range of a *good* photograph—one that you print yourself to optimize contrast—they are certainly useful and much easier to obtain.

An improvement in image quality was obtained with a slightly roundabout approach. My operating software for the *WSH* scan converter contains a COMPLEMENT function, which permits you to display a negative version of the image in memory. When the negative printing function of the P-50U was used on such a negative display image, the result was a normal positive print but one with noticeably better grayscale rendition!

Since the printer was a loaner, I did not open it up to see if the sampling range or printer output was adjustable. It is possible that you could tweak the system for a closer match to your scan converter output.

One extremely curious anomaly did pop up for which I was unable to provide an explanation. I hooked the P-50U up to the output of a Wrasse 665 scan converter to make some one-on-one comparison prints against the *WSH* scan converter, and I was astonished to find that the printer would not lock on the signal, yielding a print that looked like a TV picture with a slightly maladjusted horizontal-hold control. Nothing I was able to do would lock the picture, despite the fact that it would lock up on any of the station monitors.

The curious fact is that this inability to lock was a worry I had had with regard to the *WSH* scan converter. That unit uses a slightly off-standard horizontal and vertical sync rate to simplify the FAX and TV timing circuits. It can easily be locked up on any monitor,

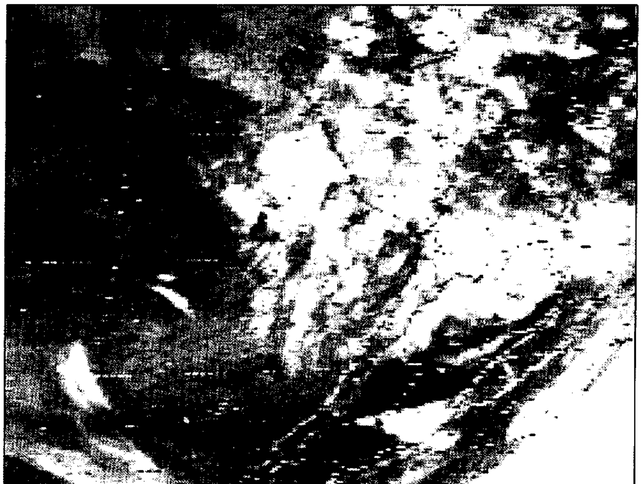


Photo B. GOES Central transmission of a SE IR quad from GOES E showing much of South America. Display and printing match the previous example. The image was obtained in the early evening, and ground heating in coastal Chile and Argentina is evident from the darker tones of these land areas.

but it will always require slight readjustment of the vertical- and horizontal-hold controls unless the monitor or TV set uses a PLL sync-recovery circuit. The P-50U employs such a circuit because it does not have any sync-lock controls.

As the prints indicate, it had no trouble locking to the *WSH* scan converter output but would not lock to the FX-665 output, even though the Wrasse unit appears to be closer to broadcast standard, based on the settings of the monitor hold controls. I suspected that the P-50U might be out of adjustment, but a few prints were run from broadcast and videotaped signals with no problems.

Be aware that you *may* have a problem printing from the output of a FX-665, but I don't know why. I want to emphasize again that I have *never* had a problem locking the output of my 665 to any monitor I have used, so you shouldn't expect any problems with basic display.

The second generation of Mitsubishi printers looks quite exciting. The P-60U looks a lot like the P-50U and has many of the same features, but with expanded performance specs. The P-60U will produce images with up to 64 grayscale steps with a resolution of 640 pixels/line and 512 lines! In addition, it will handle NTSC, PAL, and SECAM video and RGB TTL, and it has a parallel port for computer graphics and titling! The P-70U has all of the features of the 60 but produces an 8-1/2" x 11" printout! The expanded dynamic range of these second-generation printers may result in a better match to most scan converters, but even if this is not the case, they sure beat fiddling with a camera for routine hard copy.

Line-Printer FAX

In reviewing various approaches to FAX image display in an earlier column, I neglected one avenue that seems to hold the interest of many—the use of a line printer to produce a picture. Most of the time this has been handled by a computer that formats the image for printing, but now a dedicated unit is available to perform this function. The unit is the Info-Tech M-800 FAX Converter, which is designed to take FAX input and output the image to a dot-matrix printer. This unit has its own microprocessor, so you do not need an accessory computer to run it.

Date	01 March 1987	
Spacecraft	NOAA-9	NOAA-10
Orbit Number	11406	2337
Eq. Crossing Time (UTC)	0001.9	0016.02
Longitude Asc. Node (Deg. W.)	135.15	70.96
Nodal Period (Min.)	102.0851	101.2766
Frequency (MHz)	137.62	137.50

These orbital parameters are projected two months in advance due to deadline considerations. Accumulated errors due to uncompensated orbital decay and other anomalies result in expectation of errors up to two minutes and possibly as many degrees in terms of the crossing data and possible small changes in the indicated period. Users requiring precision tracking data should rely on more current sources.

Table 1. TIROS/NOAA orbital predict data.

The M-800 was brought to my attention by Fred Osterman of Universal Shortwave Radio (1280 Aida Drive, Reynoldsburg OH 43068; 614-866-4267), one of the major marketing outlets for the M-800. The M-800 will handle both AM FAX (weather satellite format) or FM (1,500-Hz black to 2,300-Hz white), which is almost universally used for shortwave FAX broadcasts. The unit will accept 60-, 90-, 120-, and 240-lpm FAX signals, with selection of several indices of cooperation. It is powered from a 12-V wall-mount transformer/supply and features easy hookup between the receiver and printer. DIP switches inside the M-800 are set to match the printer you will be using. The instruction manual concentrates on use with the Epson FX-85 and LQ-800 printers, although supplementary information is provided on other compatible printers as noted by M-800 owners.

The printer turns out to be one of the most critical factors with regard to the performance of the M-800. The unit has limited video buffer capacity and must operate very close to real time. If it is to be able to keep up with the FAX signals, it must print as many lines as possible with each pass of the print head, which is where the real performance break occurs.

Relatively inexpensive printers (such as the FX-85) have eight or nine wire print heads, limiting them to fewer lines per printing pass in comparison with high-end dot-matrix printers (such as the LQ-800), which have 24 pin heads. Everything else being equal, the LQ-800 can handle a faster format than the FX-85 simply because it prints more lines on each printing pass.

The type of video is also a factor. The M-800 can be switched to handle line (black or white) or grayscale video. Grayscale video requires more manipulation during each pass so that a given printer can handle a faster format with line video than it can in the grayscale mode. These two factors interrelate in the following way with regard to the 120- and 240-lpm formats of greatest interest to satellite types:

	120 Lpm	240 Lpm
LQ-800	Grayscale/line	Line only
FX-85	Line only	—

The LQ-800 could handle side-by-side NOAA or standard METEOR display in the grayscale mode at 120 lpm and would also be suitable for WEFAX charts at 240 lpm. The FX-85 is not useful for satellite work since the best it can accomplish is side-by-side chart display at 120 lpm from WEFAX chart transmissions, and this results in considerable reduction in resolution and problems with aspect ratio.

These constraints are not very significant for HF work since charts are transmitted at 120 lpm, while wirephotos, where grayscale reproduction is desirable, are usually transmitted at 60 or 90 lpm. Thus the M-800 linked to an FX-85 will handle virtually all useful HF products. For satellite work, you would need a printer with the capabilities of the LQ-800 for NOAA, METEOR, and WEFAX charts, and even that printer could not handle WEFAX products in the grayscale mode.

The M-800 does a very fine job on line charts, and resolution is equivalent and contrast superior to the typical FAX recorder. The grayscale output is quite reasonable when viewed from a modest distance. The M-800 unit I received worked straight out of the box when connected to an RX-80 printer using a standard printer cable.

Copy was excellent with 120-lpm HF chart transmissions, and all the phasing and auto-start functions worked perfectly. The charts were of very high quality, and I would suspect that with the better printer, full resolution charts via WEFAX would be a snap. I did check out the start and phasing functions on WEFAX and they worked perfectly, although the printer was not suitable for delivering full resolution at that speed.

If you have an interest in HF FAX, you should definitely look at the M-800 as an alternative to an expensive FAX machine. For satellite work, you must have the high-quality printer if you expect to get usable copy.

The only real drawback to the M-800 is the printer noise. It is acceptable for occasional use, but if the printing schedule were heavy, I would want the printer in another room! I should note that line printing is quite a bit quieter than grayscale.

Operating expenses for the system are quite reasonable, consisting primarily of standard printer paper and a ribbon re-inker (a necessity if you will be doing a lot of printing, particularly in the gray-

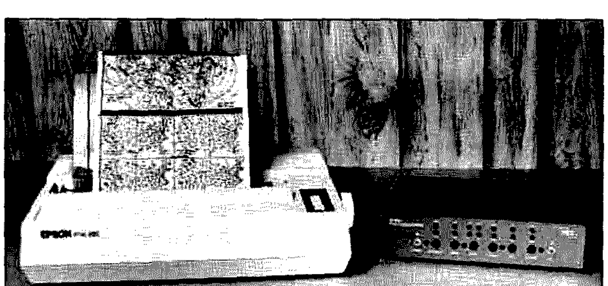


Photo C. The Info-Tech M-800 FAX converter and an Epson FX-85 printer. Photograph courtesy of Universal Shortwave Radio.

scale mode). The M-800 would certainly be the system of choice for printing an occasional 120-lpm chart from HF and, with the better printer, could serve the same role for WEFAX charts.

News

The first item concerns the deactivation of NOAA-6 now that NOAA-10 is operational. This is no news to most of you but may persuade the occasional listener to stop looking for this particular bird.

Soviet METEOR/COSMOS watchers should concentrate on 137.30, 137.40, and 137.85. I am still looking for a reliable news feed to keep up-to-date on Soviet weather satellites, so hang in there.

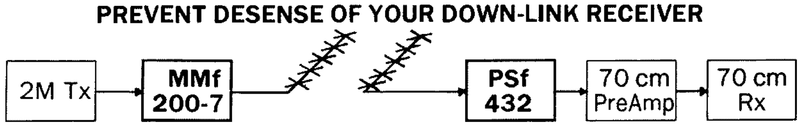
The final item this month concerns variations in GOES C signal levels. The problem is that this spacecraft is now running short of fuel, resulting in accumulating plane errors in the orbit and a slight slippage in strict geostationary geometry.

The spacecraft now appears to move in a figure-eight pattern in the sky on a 24-hour basis. Depending on your antenna pattern, the spacecraft may be moving out of your main lobe at specific times of the day. The bigger the antenna, the greater the problem due to the narrower pattern of the bigger dishes. Small dishes, despite the broader main lobe, are not immune since they have lower gain and hence a smaller system gain margin.

Since the spacecraft end of the problem will be with us and probably will get worse, until Central is ultimately replaced, we have only two alternatives. The simple approach is to decide what time of day we want optimum reception and simply readjust the antenna for solid reception at that time. The second and most complex alternative is to install motorized adjustment for both elevation and azimuth (a relatively small range of adjustment will do) and then repeak the antenna when the signal starts to fall off.

Note

References to *WSH* refer to the third edition of the *Weather Satellite Handbook*, available directly from yours truly for $12.50 plus $1 postage in the U.S. and $2 elsewhere. ■



SPECIAL EVENTS

PLAINWELL MI
MAR 1

The 1st annual State Technical Institute Hamfest will be held on March 1, from 8 a.m. to 4 p.m., at the school grounds at 33 Alber Drive, Plainwell, Michigan (located 15 miles northeast of Plainwell on Pine Lake). Admission is $2. Single tables $3. VEC examinations given. Talk-in on 146.46. For information and table reservations, write to Robert Mousseau KA8VVM, State Technical Institute, 33 Alber Drive, Plainwell MI 49080, or call the school at (616)-664-4461.

WINCHESTER IN
MAR 1

The Randolph ARA will sponsor the Randolph Amateur Radio Hamfest on March 1, from 8 a.m. to 3 p.m., at the Winchester National Guard Armory. Admission is $3 in advance, $4 at the door. Children 12 and under free with adult. 3' x 8' table space $5 (tables limited); space only, $3. Electronics and amateur radio exams. Talk-in on .90/.30 and 224.90/223.30. For more information, contact RARA, c/o Kedrick Robbins W9QUH, Rte. 1, Box 389, Parker City IN 47368; (317)-468-6568, or Jake Life W9VJX, 407 High Street, Winchester IN 47394; (317)-584-9361.

CHICOPEE MA
MAR 1

The annual MTARA flea market will be held on March 1, from 10 a.m. until 3 p.m., at the K of C Elder Council 69 Hall, Granby Road, Chicopee, Massachusetts. General admission is $2, spouse and kids free. Tables are $10 at the door, $8 in advance. Tailgating, $5. Walk-in amateur license exams given at 10:30 a.m. Talk-in on 146.34/146.94 and .52. For more information, write to MTARA, Box 3494, Springfield MA 01101, or call Bob WB1EQS at (413)-532-4891 (days) or Mickey N1CDR at (413)-562-1027 (evenings).

NEWBURGH NY
MAR 1

The Mt. Beacon ARC will hold its first annual Winter Hamfest on March 1, from 8 a.m. to 3 p.m., at the State Armory in Newburgh, New York. The armory is off the intersection of Interstates 84 and 87. General admission $3. Space for your table $4. Table provided for $5 with advance reservation. Talk-in on 146.37/.97 and 146.52. For reservations and information, contact Stan Disbrow WA2KQY, c/o Mt. Beacon ARC, PO Box 841, Wappingers Falls NY 12590; (914)-876-1659.

MORRISTOWN TN
MAR 7

The Lakeway ARC will sponsor its annual Swapfest on March 7 at the Tally Ward Recreation Center in Morristown, Tennessee. Vendor setup at 7 a.m. FCC VE exams will be given. Talk-in on .63/.03. For more information, contact Dennis Livesay KB4LSX, 3214 Horner Drive, Morristown TN 37814. Please send an SASE.

FORT MYERS FL
MAR 7

The City of Palms annual hamfest will be held at the Moose Hall on Parkmeadow Drive on March 7 from 9 a.m. to 4 p.m. Talk-in on .28/.88. For more information, contact Harry Arnold K9ALX, 5414 Brandy Circle, S.W., Fort Myers FL 33907; (813)-482-3113.

MILWAUKEE WI
MAR 7

The Milwaukee School of Engineering ARC W9HHX will hold its annual hamfest on March 7, from 8 a.m. to 2 p.m., at 1121 N. Milwaukee Street, downtown Milwaukee, Wisconsin. Tickets are $2 and 4-foot tables are $3. Talk-in on 146.19/146.79 and 146.52. For information, tickets, or tables, send SASE to W9HHXFEST, PO Box 644, Room C-6, Milwaukee WI 53201-0644.

CAVE CITY KY
MAR 7

The annual Glasgow Swapfest will be held on March 7 at the Cave City Convention Center, in Cave City, Kentucky. The swapfest will start at 8 a.m. Central time and will continue until everyone goes home. Admission is $3 per person. Extra tables are available at $3 each. FCC VE tests will begin at 10 a.m.—walk-ins only. Talk-in on 146.34/.94 and 144.59/145.19. For additional information, write to N4HCO, Rte. 9, Box 112B, Glasgow KY 42141.

VALHALLA NY
MAR 8

WECAFEST '87, the Western Emergency Communications Association's third annual hamfest and electronics fair, will be held on March 8, from 9 a.m. to 3 p.m., at Westchester Community College in Valhalla, New York. Admission is $3 for adults, with young people under 16 admitted free. FCC license exams given. Talk-in on 147.66/.06, 146.52, 222.80/224.40, and 442.475/447.475. Dealer inquiries should be addressed to WECAFEST '87, PO Box 348, Millwood NY 10546.

INDIANAPOLIS IN
MAR 8

The Morgan County Repeater Association will sponsor the Indiana Hamfest on March 8, beginning at 8 a.m., at the Indiana State Fairgrounds' Pavilion Building in Indianapolis, Indiana. Admission is $5 at the door. 8-foot flea market tables (including space) $8 each. No space will be sold without table. Advance reservations suggested. Talk-in on 145.25. For table reservations or information, send an SASE before February 25 to Aileen Scales KC9YA, 3142 Market Place, Bloomington IN 47401; (812)-339-4446.

MADISON NJ
MAR 13

The Splitrock ARA will sponsor its second annual Evening Hamfest on March 13 at Drew University Center, Room 107, Rte. 24, Madison, New Jersey. Doors open at 7 p.m. Admission for buyers, $2. Tables available in several sizes from $2 to $8 per table. Talk-in will be on 146.985 outside Madison area or on 146.58 in Madison area. For further information, write to SARA, PO Box 3, Whippany NJ 07981, or call Steve Halliburton WA2SOC at (201)-366-9642.

ST. LOUIS MO
MAR 13

The Jefferson Barracks ARC will hold its 27th annual Amateur Radio Auction on March 13, beginning at 7:30 p.m., at the Concordia Turners Hall, 6432 Gravois, in south St. Louis City, Missouri. Talk-in on .52, 146.94, or 145.21.

RATTLESNAKE ROUNDUP
MAR 13–15

Nolan County ARC of Sweetwater, Texas, will operate a special-event station during the World's Largest Rattlesnake Roundup on March 13–15. Operation will be on the 20- and 40-meter General phone bands from 1500–2400 UTC. For a certificate, send a large SASE and QSL to WR5B, Rte. 2, Box 121-A, Sweetwater TX 79556.

FAIRBANKS ICE FESTIVAL
MAR 13–22

The operators in and around the local area of Fairbanks, Alaska, in cooperation with the Arctic ARC and North Star Borough, will be running special-event stations for the Fairbanks Ice Festival (March 13–22) and the Yukon Quest Sled Dog Race, which starts at the end of February. Look for stations on 10–160, most modes. Special QSLs will be available via the station worked. All cards will go via the bureau unless an SASE or SAE and return postage are supplied.

HUDSON NH
MAR 14

The Interstate Repeater Society of Derry, New Hampshire, will hold its annual flea market on March 14, from 8 a.m. to 4 p.m., in Hudson NH at the Lions Club Hall, Lions Avenue. Admission is $1 and tables are $8 each. Talk-in on 146.85. Call for table reservations at (603)-623-0628 or (603)-883-9441, or write to IRS, PO Box 693, Derry NH 03038.

MIDLAND TX
MAR 14–15

The Midland ARC will hold its annual St. Patrick's Swapfest on March 14, from 10 a.m. to 5 p.m., and March 15, from 8 a.m. to 2:30 p.m., at the Midland County Exhibit Building, located east of Midland on the north side of Highway 80. Pre-registration is $5, $6 at the door. Tables are $6 each. VE tests for all categories given. For further information and reservations, please write to Midland ARC, PO Box 4401, Midland TX 79704.

PUTNAM CT
MAR 15

The Eastern Connecticut Amateur Association will hold its 13th annual flea market on March 15 at the Elks Hall on Edmund Street, Putnam, Connecticut, just off Exit 96 of Interstate 395. Admission is $2, tables $7 each. Talk-in on 147.225/.825 and 146.52. For further information, contact either Don Amirault K1APE, 66 Labonte Road, RR 1 Box 310, Thompson CT 06277; (203)-923-2727 or Dick Spahl K1SYI, Lake Parkway, Webster MA 01570; (617)-943-4420 after 7 p.m.

STERLING IL
MAR 15

The Sterling-Rock Falls ARS will hold its 27th annual hamfest at the Sterling High School Fieldhouse, 1608 4th Avenue. Doors will open at 7:30 a.m. Tickets $3 in advance, $4 at the door. Commercial tables and tables requiring electricity $5, others $3. Talk-in on 146.25/.85. For more information, tables, or tickets, contact Sue Peters, PO Box 521, Sterling IL 61081; (815)-625-9262.

WEST HARTFORD CT
MAR 15

The Insurance City Repeater Club will hold its annual Computer/Amateur Radio Flea Market on March 15, from 9 a.m. to 2 p.m., at the American School for the Deaf in West Hartford, Connecticut. Admission is $2, tables $10. Talk-in on 146.88 and 147.15. Contact Chuck Motes K1DFS, 22 Woodside Lane, Plainville CT 06062.

CHICAGO SEMINARS
MAR 15–16

The Chicago ARC will hold a continuous seminar entitled "Introduction to Amateur Radio" on March 15, from 12 noon till 5 p.m., at the North Park Village, Community Room, 5801 N. Pulaski Road, Chicago. Live operation of transmitting and receiving equipment will be demonstrated. ARRL film "The World of Amateur Radio" will be shown. The amateur radio "Novice Class" license seminar will be held on March 16 at 7:30 p.m. at the same address in the "J" building. For more information, call (312)-545-3622.

MARSHALL MI
MAR 21

The Southern Michigan ARS and the Marshall High School Photo Electronics Club will sponsor the 26th annual Michigan Crossroads Hamfest on March 21, from 8 a.m. to 3 p.m., at Marshall High School. Directions: I-69 to I-94, then east to Exit 110 (old U.S. 27), then south and east to school. Tickets $2 in advance (SASE) or $3 at the door. Table reservations 50¢ per foot (minimum of four feet). Send SASE to SMARS, PO Box 934, Battle Creek MI 49016, or call Wes Chaney N8BDM at (616)-979-3433. Talk-in on 146.67, 146.52, or 223.94. Exams given at 9:30 a.m.; send Form 610, SASE, and $4.25 (payable to ARRL/VEC) to License Exam, PO Box 2, Pleasant Lake MI 49272.

FORT WALTON BEACH FL
MAR 21–22

The Playground ARC will sponsor its 17th annual North Florida Ham/Swapfest on March 21, from 8 a.m. to 4 p.m., and March 22, from 8 a.m. to 3 p.m., at the Shrine Fairgrounds on Lewis Turner Blvd. in north Fort Walton Beach. FCC exams Saturday only. Talk-in on 146.19/.79 and .52. For more information, write to PARC Ham/Swapfest, PO Box 873, Fort Walton Beach FL 32549.

TRENTON NJ
MAR 22

The Delaware Valley RA will sponsor HAMCOMP '87, its 15th annual flea market of amateur radio and computer equipment on March 22, from 8 a.m. to 2 p.m., at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, Lawrence Township, approximately two miles north of the I-95, Rte. 206 interchange. Admission is $3 in advance, $4 at the door. Indoor selling spaces are $10 (wall space) or $7; outdoor spaces are $6. No tables provided. Talk-in on 146.07/.67. For more information and space reservations, write to HAMCOMP '87, c/o KB2ZY, Box 441B, R.D. #1, Stockton NJ 08559 (SASE please).

MAUMEE OH
MAR 22

The Toledo Mobile Radio Association, Inc. will hold its 32nd annual Hamfest and Computer Show on March 22, from 8 a.m. to 5 p.m., at the Lucas County Recreation Center, Key Street, Maumee, Ohio. Tickets cost $2.50 in advance or $3 at the door. Tables are available. For tickets and table information, please send an SASE to TMRA, Inc., Robert Hanna K8ADK, 2154 Circular, Toledo OH 43614.

JEFFERSON WI
MAR 22

The Tri-County ARC (W9MQB) will hold its annual hamfest on March 22, from 8 a.m. to 3 p.m., at the Jefferson County Fairgrounds, Jefferson, Wisconsin. Tickets are $2.50 in advance, $3 at the door. Tables are $3 in advance, $4 at the door. Amateur exams given by the Milwaukee Volunteer Core Group. Talk-in on 144.89/145.49 or 146.52. For more information, tickets, or tables, send an SASE to Bob Barker K9RIJ, 724 Burdick, Milton WI 53563.

MADISON OH
MAR 22

The 9th annual Lake County ARA Hamfest will be held on March 22, from 8 a.m. to 4 p.m., at Madison High School, Burns Road at Middle Ridge Road, Madison, Ohio. Admission is $4 at the gate, $3 in advance (send SASE before March 9). Tables: 6-foot, $5; 8-foot, $6.50. Exams given, walk-ins limited (send Form 610, license, and check for $4.35 made out to ARRL/VEC by March 15). Talk-in on 147.81/.21. For further details, call (216)-953-9784 in Cleveland or write to Lake County Hamfest Committee, 7803 Skylineview Drive, Mentor OH 44060.

CHERRY BLOSSOM FESTIVAL
MAR 28

The Macon ARC will operate W4BKM from 1500 UTC until 2100 UTC on March 28 to commemorate the Cherry Blossom Festival. Operation will be phone 14.237 and CW 7.137. For a Cherry Blossom Certificate, send a large SASE to Macon ARC, PO Box 4862, Macon GA 31208-4862.

EGG HARBOR CITY NJ
MAR 28

Shore Points ARC invites everyone to Springfest '87 on March 28, from 9 a.m. to 2 p.m., at the Atlantic County 4-H Center, Rte. 50, Egg Harbor City, New Jersey (approximately 15 miles west of Atlantic City). Tailgating available, weather permitting. Limited ac in

indoor space. Sellers $5 per space (bring own table); buyers, $3. Talk-in on 146.985 and .52. For more information, write to SPARC, PO Box 142, Absecon NJ 08201.

UPPER SADDLE RIVER NJ
MAR 28

The Chestnut Ridge RC will sponsor its 10th annual ham radio flea market on March 28 at the Education Building, Saddle River Reformed Church, East Saddle River Road and Weiss Road, Upper Saddle River, New Jersey. $1 admission fee. $10 for the first table, $5 each additional table. Tailgating, $5. For more information, call Jack Meagher W2EHD at (201)-768-8360.

LAWTON OK
MAR 28

The Lawton-Ft. Sill ARC will hold its 40th annual old-fashioned one-day swapfest on March 28, from 8 a.m. to 6 p.m., at the County Fairgrounds in Lawton, Oklahoma. Admission is $2 at the door. Tailgating $3, tables $5. No pre-registration. For more information, write to Don K5CKQ, 912 Bell Street, Lawton OK 73507.

BALTIMORE MD
MAR 28–29

The Baltimore ARC, Inc., will present the 1987 Greater Baltimore Hamboree and Computerfest on March 28th and 29th at the Maryland State Fairgrounds Exhibition Complex in Timonium, Maryland (east of I-83 Exit 17, three miles north of I-695, just north of Baltimore). The Hamboree and Computerfest will be open from 8 a.m. to 5 p.m. on Saturday and from 8 a.m. to 4 p.m. on Sunday. Admission is $4 for one day or $6 for both days, children under 12 free. For additional information and display space reservations, contact GBH&C, PO Box 95, Timonium MD 21093-0095; (301)-HAM-FEST.

ELIZABETHTOWN KY
MAR 28–29

The Lincoln Trail ARC will hold a hamfest on March 28 and 29 at the Pritchard Community Center, Elizabethtown, Kentucky. Admission is $5 in advance, $6 at the door. Tables (must be reserved): $10 for one day, $15 for both days. Flea market space: $5 for one day, $8 for both days, plus admission ticket. Talk-in on 146.52 or 146.38/.98. For advance tickets and set-up reservations, contact Hubert Hensley WD4GDA, PO Box 342, Vine Grove KY 40175; (502)-877-2234.

GRAYSLAKE IL
MAR 29

The Libertyville and Mundelein ARS will sponsor Lamarsfest 1987 on March 29, from 8 a.m. to 2 p.m., at Lake County Fairgrounds, Grayslake, Illinois. Directions: I-294, Exit Rte. 120 West, right on Rte. 45; fairgrounds two blocks on the left. Admission is $2 in advance (deadline by mail is 3/20) or $3 at the door. Exams given. Talk-in on 147.63/.03 or 146.52. For more information or reservations, contact Lamars, c/o Marc Abramson, PO Box 751, Libertyville IL 60048; (312)-255-0642, 8–10 p.m.

WALLA WALLA WA
MAR 29

The Walla Walla Valley ARC will hold its annual indoor Swap-Meet on March 29, from 8 a.m. to 5 p.m., at the Oregon Community Building in Milton-Freewater. Tables will be $5 and admission is free. Talk-in on 147.88/.28. For more information, contact Bernie Frazier WA7CBX, 610 S. 1st Avenue, Walla Walla WA 99362; (509)-529-9879.

AURORA CO
MAR 29

The annual ARA Swapfest will be held on March 29, from 8 a.m. to 3 p.m., at the Colorado National Guard Armory, 55 S. Potomac, Aurora, Colorado. Talk-in on 147.75/.15. For more information, call Linc Haymaker at (303)-680-0349.

WILLINGBORO NJ
APR 5

The Willingboro Repeater Group will hold its annual hamfest on April 5, from 8 a.m. to 2 p.m., at Holiday Lakes, Rte. 130 and Creek Road, Willingboro, New Jersey. Admission is $3 at the door or $2.50 in advance, XYLs and children under 16 free. Table space: $5 per 8-foot table. Tailgaters must purchase an admission ticket, outdoor selling only. Talk-in on 146.925 or 146.52. For further information, write to Willingboro Area Repeater Group, PO Box 472, Willingboro NJ 08046, or call Jack K2KLM at (609)-877-5249 after 6 p.m.

FRAMINGHAM MA
APR 5

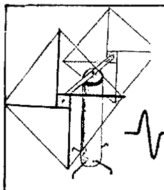
The Framingham ARA will hold its annual spring flea market and exams on April 5, beginning at 10 a.m., at the Framingham Civic League Bldg., 214 Concord Street (Rte. 126), in downtown Framingham, Massachusetts. Admission is $2 and tables are $10 (includes one free admission). Pre-registration is required for tables and exams. Talk-in on .75/.15. To reserve tables, contact Jon Weiner K1VVC, 52 Overlook Drive, Framingham MA 01701; (617)-877-7166. To register for license exams, send completed Form 610, copy of ham license, and check for $4.25 payable to ARRL/VEC to FARA, PO Box 3005, Framingham MA 01701. Walk-in exams given on a space-available basis.

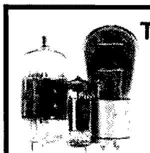
MADISON WI
APR 5

The Madison Area Repeater Association, Inc., will hold its 15th annual Madison Swapfest on April 5, beginning at 8 a.m., at the Dane County Exposition Center Forum Building in Madison, Wisconsin. Admission is $2.50 in advance and $3 at the door. Children 12 and under are admitted free. Tables are $5 each in advance and $6 at the door, plus admission. Reserve by March 31. Talk-in on 146.16/.76. For admission tickets, table reservations, or information on commercial exhibit space, contact MARA, PO Box 3403, Madison WI 53704; (608)-274-5153.

SUBMARINE SERVICE ANNIVERSARY
APR 11–12

The Olympia RAC will celebrate the anniversary of the United States Submarine Service by operating station WA3BAT from the U.S.S. Becuna, a World War II submarine, and the U.S.S. Olympia, flagship of Admiral Dewey in 1898. Transmissions can be heard beginning 1300 UTC on April 11 until 2000 UTC on April 12. CW frequencies will be 3.590, 7.050, 14.050, 21.090, and 28.150. Phone frequencies will be 3.890, 7.240, 21.360, and 28.600 (all frequencies within 10 kHz). Two-meter and Novice operation are also planned. For a certificate and additional information, send business-sized SASE (U.S.) or one IRC (foreign) to Olympia Radio Amateur Club, PO Box 928, Philadelphia PA 19105.



CIRCUITS

Number 6 on your Feedback card

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (no more than two double-spaced pages) and include a clear diagram or schematic if needed.

If your circuit is published you will receive a one-year subscription (or extension) to 73. Submit your circuits to 73 Magazine, Editorial Offices, WGE Center, Peterborough NH 03458, Attn. Circuits.

Following the old "KISS" principle (Keep It Simple, Stupid), I recommend this simple "three-piece CPO" (Fig. 1) to budding Novices. The piezo buzzer is available at most hamfests or from any Radio Shack store.

Skip Westrich WB8OWM
Canton OH

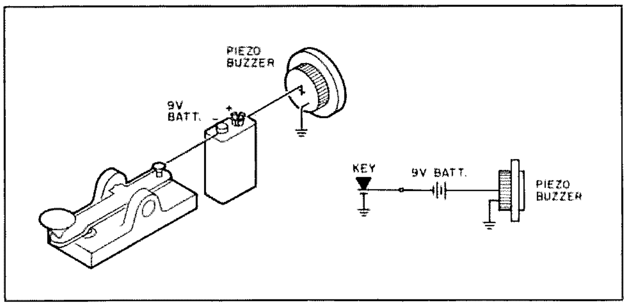


Fig. 1. Three-piece CPO.

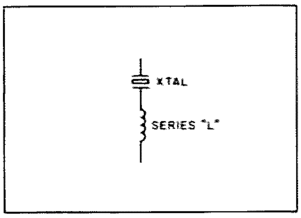


Fig. 2. Crystal frequency shift.

One way of moving a crystal's frequency, besides padding it with capacity, is to insert series inductance (Fig. 2). Depending on the crystal's characteristics, frequency changes of about 1,000 ppm may be obtained with 20 to 30 uH.

Bob Raker WB8ZFF
Cincinnati OH

The idea of a filament choke is isolation from ground. This allows power to be fed to the cathode. For practical purposes, about 500 to 600 Ohms of isolation is sufficient. To construct the choke, twist together two 6–8-inch lengths of #12 or #14 insulated wire. Then take 35 ferrite beads made from #73 material and slip them over the twisted pair of wires. Secure the beads with electrical tape and connect one end to the filament of the tube and the other to the filament voltage. The choke should give about 750 Ohms of isolation.

Matt Erickson WA4WAX
DeLand FL

Being dissatisfied with low-duty-cycle (one minute on/twenty minutes to cool) bulk-tape/cartridge erasers, I built one better suited for my purposes (Fig. 5). I took an old power-supply filter choke from a TV set, removed the "I" section of the laminations, and taped it up for mechanical and electrical security. It works perfectly without quickly overheating. The one I used shows a dc resistance of 40 Ohms. Exact impedance is not critical so long as it offers enough load to the line that it doesn't draw excessive current, which is the weakness of the commercial one I described.

Wm. Bruce Cameron WA4UZM
Temple Terrace FL

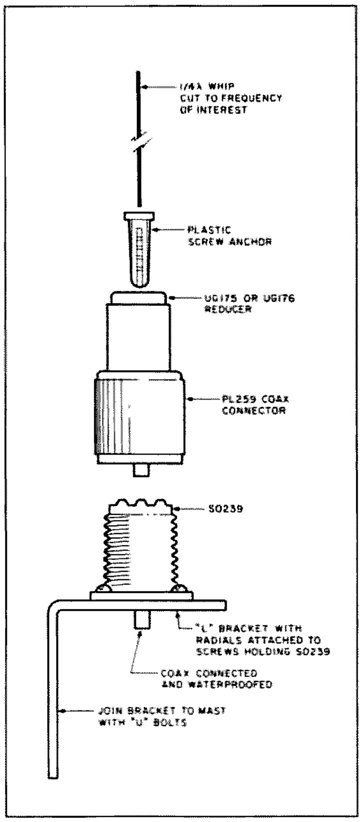


Fig. 3. Simple construction of a VHF whip.

A simple solution for insulating a vertical radiator is shown in Fig. 3. A plastic screw anchor available from a local hardware store is inserted into the reducer. These anchors (used to hold screws in plaster walls, cement, etc.) come in various sizes that allow for different diameters of whip. Fig. 4 shows the radial construction. The radials should be bent at 45° angles.

Richard E. Duell W9LSD
Cocoa FL

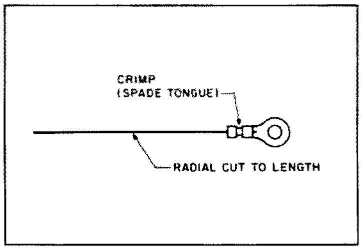


Fig. 4. Radial construction.

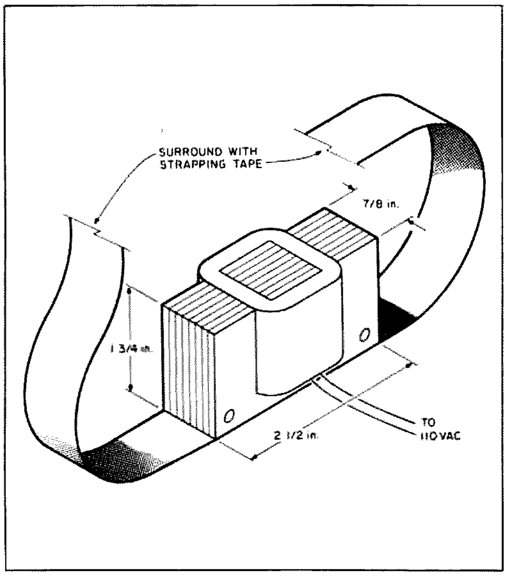


Fig. 5. Better bulk eraser.

FT-102 owners: When you are using VOX for CW operation, the VOX circuit is held OFF for a few microseconds. It is enabled as the first part of the first character is sent. When the VOX is activated, a rising-tone chirp or yoop can be heard. The chirp is caused by capacitor C153, a 3.3-uF capacitor on local-unit board 2345. Remove the bottom cover and locate C153. It is a tubular capacitor standing on end. Using a pair of dikes, cut one lead of the capacitor. It is OK to leave it in place or it may be removed, as desired. You now have a clean CW signal. This capacitor has now been eliminated by the manufacturer, but all units should be checked.

Carl S. Zelich AA4MI
Merrit Island FL

BARTER 'N' BUY

Number 15 on your Feedback card

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 60-page catalog, $3. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90815. BNB045

MARINE RADIO: Marconi Canada CH-125 synthesized AM/SSB transceiver, 22 channels on 4, 8, and 12 MHz, 125 Watts, 12 V dc. Never used, list $1,995, asking $1,495. Perry Donham KW1O, 70 Rte. 202 North, Peterborough NH 03458. BNB047

QSLs to order. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

THE DX'ERS MAGAZINE. Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DXCC Honor Roll Certificate 2-4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

IMRA—International Mission Radio Association. Forty countries, 800 members. Assists missionaries with equipment loaned, weekday net. 14.280 MHz, 2–3 p.m. Eastern. Brother Bernard Frey, 1 Pryer Manor Road, Larchmont NY 10538. BNB326

RADIO TRANSCRIPTION DISCS WANTED. Any size, speed. W7FIZ—WG, Box 724, Redmond WA 98073-0724. BNB347

DOCKING BOOSTERS—Fantastic 30-Watt (50-Watt with GaAsFET preamp) console amplifiers for your VHF or UHF hand-held transceiver, from $129.95. Write for free catalog of all our communications products. Skywave Radio, Box Q-1, 943 Boblett, Blaine WA 98230. BNB407

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DX AWARDS. Need info on any DX awards, especially lesser known ones. Check incoming cards for stickers or award notices. Directory planned for mid-1987. Ted Melinosky K2BV, 525 Foster Street, South Windsor CT 06074. BNB526

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DE FOREST AUDION UV nickel base, $1,500 plus shipping, certified funds. John Brolley, 1225 Los Pueblos, Los Alamos NM 87544. BNB530

REAL-TIME HF WEFAX MAPS on a dot-matrix printer. Available for Commodore, IBM, Apple, Atari, and CoCo. See March 86 *QST* Magazine for circuit details. Kit $28.15. Assembled $39.95. Software—Apple, Atari, and Commodore $10. IBM—$15 plus $2.50 shipping. For info, send large SASE. A & A Engineering, 2521 W. La Palma #K, Anaheim CA 92801; (714)-952-2114. BNB531

QSLs, QSLs, RUSPRINT QSLs. Quantities of 100, 200, 300, or more. Full color Old Glory and Liberty. Also Parchment, Golden Eagle, and others. SASE appreciated. Rte. 1, Box 363-73, Spring Hill KS 66083. BNB532

SINCLAIR ON PACKET? COMLINK I makes it easy. Free info. A. Eckhardt, 918 Anna Street, Boalsburg PA 16827. BNB533

WANTED: RME 4301 SSB adapter, 4320 speaker. K8UHX, River Road, Hinckley OH 44233. BNB534

NEW PATENTED ANTENNA invention design delivers 30 dB gain compared to a dipole on 80 through 10 meters. Total parts cost under $10—For complete instruction manual, send only $24 postpaid to: R. Christie, PO Box 69, Queens Village Station, Jamaica NY 11428. BNB535

WANTED: Heath Mohawk Receiver. Excellent only. Will pick up within 400 miles. Also want Collins 312B3 Speaker and 2.7-, 3.1-, 4.0-, and 6.0-kHz filters for S-line. Bill Smitherman, Rte. 4, Box 37, East Bend NC 27018. BNB536

WOULD LIKE TO BUY post office zip code and directory printed before 1980. Bernard Fair, 19455 Houghton, Detroit MI 48219. BNB537

THE 18TH ANNUAL B*A*S*H will be held on Friday night of the Hamvention, April 24, 1987 at the Conference Center (Madison Room) of the HARA Arena and Conference Center (the same location as the Hamvention), starting at 7 p.m. There is no admission charge, and free continuous entertainment. Hot dinner, sandwiches, snacks, and beverages are available. Two exciting top awards and many others. Stay right at HARA when the Hamvention closes on Friday evening and meet your friends and join us for an evening of fun and entertainment. Sponsored by the Miami Valley FM Association, PO Box 263, Dayton OH 45401. BNB538

NEVER SAY DIE

from page 12

come close to living up to your responsibility. That's a prostitution of everything we stand for—a completely dishonorable thing to do.

Oh, I suppose we should make allowances during contests, since winning a contest is far more important than honor or country. These things have to be kept in perspective. Winning, as they say, isn't important, it's everything—which probably explains the pervasive cheating in our contests—over power, imaginary contacts in the logs, two-meter cheat-nets, and so on. Is it even possible for an honest ham to win a major contest? I suppose these are things better left unwritten—unthought about. I know they're things I'll never bring up in my editorials.

Okay—you have your instructions. Get your rig fired up, aim your beam at Russia, and start making good friends with every Russian op you can find. You've got years of bad operating on your part to correct. Verging on illegal, I'd say. Maybe verging over it. Repent!

And hey, let me know how you make out. Yes, I'll be monitoring you—listening—making a note of your call if I hear you just swapping signal reports. Yes, if you fink out, I'm liable to expose your perfidy right here in *73* so everyone will know you for the wimp you are. Beware my wrath.

A note to any ham who is dense enough to take the above seriously—go soak your head. Lordy! I don't know what things are coming to—gripes when I give women hell for being in a minority on our ham bands—gripes when I beef about that awful operator in Watts—which apparently makes me a bigot—and you should see the torches light up when I even hint the League could be improved. There's a big need for head soaking.

HOW TO CHEAT

My oh my, the letters I've been getting beefing that amateur radio is boring these days—that contacts aren't what they used to be—how amateur radio has gone downhill. Sure it has, but is writing to me the answer? Perhaps, in this case, it may have helped.

Yes, I agree with you that contacts sure can be boring. All one has to do is start tuning the bands and listen to the cookie-cutter QSOs which clutter things so badly it's difficult to find a frequency to cut cookies on.

Can hamming be made more fun? Now what in the world is Wayne going to come up with to solve this problem—and solve it, I can. There is a secret to interesting contacts, one obviously lost in the sands of time, but of which I am privy and will reveal. Now all you have to do is make copies of this editorial and send it to the boring old fa... er... chaps you've contacted recently... right?

The first step in solving this age-old ham misery is to recognize that it is just that, a problem that has been with us for all ham recorded history. Hells bells, Hiram Maxim used to bitch about this in his early 30s "The Old Man" editorials, so the problem has been around even longer than Wayne Green.

I think the problem is more noticeable these days because we're having so few new hams—hams who haven't yet been worn into the same old mold by virtue of thousands of cookie-cutter contacts. In case you missed the bad news, the number of new hams has been dropping—seriously dropping. Yes, yes, I've read the same Pollyanna crap you have about us having more hams—but you can only come up with those silly numbers if you don't count those full pages of Silent Keys in *QST*. The fact is that the FCC doesn't know within about 15% how many of us are actually still alive. And I'm not even discussing the brain-dead I hear on some repeaters.

Okay. The first step toward finding more interesting contacts on the ham bands is to recognize the power of what is called in psychological circles "projection." This is the mechanism which causes all of us to see our own problems reflected in others around us. Yes, you've got it. The problem is not them, it's us. Or, as Pogo said, "We've met the enemy and the enemy is us." Or something along that line.

After you get over being angry with me for fingering you as the problem perhaps we can get busy solving it. Remember, until you're able to state a problem, the resolution will be most difficult. And once you've stated the problem, the solution is generally obvious. Hey, I don't mean to be abusive, but isn't it time we called a spade a shovel and started digging for the solution?

What I'm suggesting is some serious thought about your on-the-air performance. Are you radiologically impotent? Remember, to consummate intercourse (talking, I mean—oh, what a filthy mind you have—I'm absolutely disgusted with you for thinking impure thoughts like that) you have to excite your partner—the person with whom you are having a QSO. It may come as a rude shock to you if I reveal some long hidden ham lore... a recitation of the usual baloney... your rig, signal report, weather, location, antenna, serial number of your mike, ad nauseum... is not going to generate much heat—much enthusiasm.

"Now and then I strike pay dirt and have a whale of a contact."

Hey, have you ever had the guts to record your transmissions and listen to them later? No, of course you haven't. What could be more boring, right? Well, that's what I'm saying. Your transmissions should be so much fun and so exciting that you sit there and have a great time listening to them over again later.

Let me ask a question. Outside of hams, do you have any friends at all? Okay, you have friends. Now think hard, what do you talk with them about? Do you ever tell any stories of things that have happened to you? Ever talk about things you've done recently? Unless you're a worse turkey than I think, you actually are capable of talking about something which will interest others. Now, how are you going to get some of that into your ham contacts?

One way is to make some notes on things to talk about. Sure, it's a lot more difficult to maintain a conversation with someone when you don't get the usual feedback—nods, uh-huhs, yeahs, and such. Well, that's your fault for not developing duplex ham contacts instead of the silly one-way stuff we've been stuck with all these years.

Real old-timers will remember when we did have duplex—and they'll tell you what fun we used to have with it. I got a note from Roy Neal K6DUE at Ham/West saying an old friend of mine, Walt Zuckerman WA6BMG, who used to be W2LBF in Brooklyn when he got his ticket around 1938, passed along his regards, wondering if I remembered him. You bet! When I was an SWL (a polite name for a bootlegger in those days) I used to visit Walt, who lived about four blocks away on Ocean Avenue, and sit with him and talk on 160 meters.

Most of the 160m gang had 6L6 crystal oscillators modulated by a second 6L6, running maybe 10 Watts or so. By lining up stations on the high and low end of the band, we were able to all rebroadcast each other so six or more of us could all sit and talk in a round table—all hearing each other just as we would if we were in the same room. That was fun none of the old-timers will ever forget.

This fun came to an end when the FCC made a rule prohibiting the use of the carrier for purposes other than communications. They didn't rule out duplex on purpose, it just got blown away when they were stopping the few jerks who would broadcast phonograph records for hours. Yes, we had an ample supply of jerks then, too.

Actually, a strict interpretation of the rule would have allowed duplex, because someone was listening to every carrier and every carrier was thus being used for communications. Years later I worked this out when I had fun putting together two-band contacts between 75m and 20m, broadcasting on both bands at once, repeating 20m stations from Africa or Australia for our 75m round table to contact. I checked with the FCC at the time and got the okay on that. That didn't stop one officious FCC monitor from sending me a pink card, but it did help get him off my back when I sent him a copy of Washington's okay for what I was doing.

Duplex beats the heck out of simplex, so we should have developed some practical duplex sys-

tems years ago. This is just another case of our getting into a rut and not even knowing it. When we started developing our repeater systems we had an ideal opportunity to make them duplex. Another missed opportunity.

Getting back to making your contacts more interesting, since we're stuck with stupid simplex you've got to make the best of it. Either that or else start working on some practical duplex systems which I can promote in *73*. I'm game if you aren't so encrusted with tradition that you are frozen.

Know any jokes? Good grief, you're hearing 'em every day at work, from friends, and on TV. If you don't have a good collection of jokes by now it's because you aren't even trying to get along with people. The next time you hear some jokes, make a note of them and work them into your conversations with your friends and family. Oh, you say you don't talk with your family—hmph, that's not a big surprise. Okay, then at least try out your jokes on friends and get used to telling 'em. You can't tell jokes well without practice any more than you can roller skate without practice.

No, I'm not saying you have to go on the air as a stand-up (well, sitting down) comedian. But I am saying that the more you can work some jokes into your contacts, the more fun your contactees are going to have—and the more fun you'll have. You'll have fun for two reasons. First, you're going to start hearing something you haven't heard in years—honest compliments on how enjoyable the QSO was. Second, by being entertaining yourself you'll spark the other person to be more fun. Can you really respond to an interesting anecdote about hunting or something with your usual dumb list of the ham gear you're using, your name and location . . . over?

Think of some interesting things you've talked about with friends and make a note of them to have at hand when you get on the air. It's difficult to think (at first) when you are making one-way transmissions and aren't getting visual and verbal cues, so you need to have some operating aids at hand to help you bring out The New You.

You really want to drive someone bonkers in a QSO? I often use this fiendish ploy and with great success. What you do is flatly refuse to tell the person you're talking with what rig or antenna you are using. This breaking of the usual QSO pattern drives some chaps right up the wall. They will actually plead and beg to find out what rig you're using as you sit there smugly chuckling.

What darned business is it of theirs what rig you're using? They're hearing you, so what more do they need to know? Have you ever tried NOT giving a signal report? I often will tell a chap he's nice and loud and leave it at that. Some even get abusive, demanding a number to put in their log. Holy Moly!

Let's see if you can actually get through an entire contact with someone without discussing your equipment or the weather. Are you up to such a herculean task? Sure, it's going to take some work getting ready for such a monumental contact. You're going to need some cheat notes at hand and some practice with a few jokes. You probably won't make it the first few times you try a non-routine QSO. Stick to it. You might get out your tape recorder and analyze where you fall apart.

Now, I'm going to be listening for you on the air. You'll hear me on 20m. If you tell me your rig it's two points off. Four for the antenna. Twenty points if you mention your mike. Five off for weather. Two if you give me a signal report with numbers. Twenty if you push me to give you numbers—then I'll be listening for you on Channel 19, Good Buddy.

Now you have the message. Yes, our bands sure are packed thick with routine, boring contacts. This will change as soon as you shape up and get to be more fun to talk to. No, not every turkey out there is going to shape up, but enough will to make hamming a lot more fun for you . . . for all of us.

Oh, I have one more secret for you. I'll sure be in the dog house for this one, but I've got everyone all upset with me anyway for calling things as I see 'em, so losing a few more friends is (sigh) the price I pay. Let me put this in the form of a question. Have you ever wondered why so many hams have gotten all excited about RTTY in past years? Or why packet radio has taken off like a rocket? No, pal, it isn't because computers are involved. It's because the contacts via RTTY and packet are head and shoulders above what we're all hearing elsewhere. Sure, the difficulty (which isn't much) of getting on RTTY or packet is a filter which removes a high percentage of our ham dross. Now don't you dare mention I wrote anything about this or I'll be in hot water with the packet crowd.

If any of you have some surprising success stories resulting from your applying my suggestions for pepping up your contacts, please drop me a note. Don't get mad if I don't answer personally. But know that I do read every letter I get—and probably answer 75% of 'em. I'm going to have to back off on answers so I can get other things done. I want to know if you notice any improvement as a result of this. Hamming will remain boring for you only as long as you are boring to others.

There are plenty of interesting things to talk about, once you get the hang of it. I've found hams interested in Hopper (the painter), and we've shared our excitement in seeing the Hopper paintings duplicated in Steve Martin's movie, "Pennies From Heaven." Or perhaps we get to talking about computers—or cameras. All you have to do to make a QSO intensely interesting to the other person is ask a question about something the person knows about. You then sit back. You'll find the more you can get the other person to talk, the more exciting (s)he will find the QSO. So listen for clues—and throw in plenty of your own.

I often drop hints about my interest in cars, horses, dogs, travel, skin diving, skiing, cooking, and so on. Oh, I don't recite a list of my interests, rather I mention a few in passing and wait to see if the bait is taken. More often than not the other chap is so used to not hearing anything that he isn't really listening, so I get the usual minus fifty point QSO. Now and then I strike pay dirt and have a whale of a contact. It happens often enough to keep me coming back for more.

Let's see, is there anything interesting about your work I might like to hear about? A trip you've made? Some ham exploit—like a new rare one? Did you catch an aurora opening on two meters and work a bunch? Maybe you've caught some unusual skip on six? Sure, it's self-serving, but you could do worse than read *73* and comment on the interesting articles (if you find any)—or the lack of them, if being a curmudgeon is your bag.

Are you reading the International News in *73*? We're not putting it in just to fill space. You'll find some great stuff there. And if you work DX, you'll have a good start on a good contact when you show you're interested enough in a country to have read about it. If you're not working DX, shame all over you. That's one of the big excitements we have in amateur radio. Yes, I know all about the crummy sunspots; they just make it a bit more difficult to work DX, they don't stop it. And you don't need a twelve-element beam to get out—or even a kilowatt. With a barefoot rig, a dipole, and some persistence you can work 'em. No, you won't work 392 countries, but you'll have plenty of fun QSOs.

Commercial: Find the ad for the *73* QSL cards and get a stack. From now on you be sure to send a card to every new chap you work and thank him (or her) for the QSO—write on the card how much you enjoyed the contact. I suggest the card with your call letters in the largest size available so once it's on the other chap's shack wall it'll stand out.

A QSL card might even help you make a second contact with the person, allowing you to start building a relationship. If you have a computer you can keep track of the other chap's interests. I used to keep a 3 x 5 card file of my contacts and it worked wonders. I have virtually no memory at all—a real head start toward Alzheimer's—so the card index was perfect for me. Oh yes, Bill, the retired brakeman who's interested in orchids. A computer is better these days if it has a hard disk to provide you the memory you need. They aren't all that expensive, so don't whimper about not being able to afford one. Besides, surmounting the frustration of conquering a new computer will give you oodles to talk about on the air.

Now get busy.

KIDDING AROUND

Several ham clubs have written, asking how they can go about getting youngsters to join their clubs. It's not as difficult as you might

"The FCC doesn't know within about 15% how many of us are actually still alive."

imagine. Let's see what we come up with.

The first hurdle is getting kids to even come to the club to see what it's about. We're looking for kids who are around 12 years old—that's when the ham hobby hits the hardest and the most permanently. A 12-year-old kid is going to have parents who are around 35, which means 35 to them is going to be "old." The average ham, now 56, is the age of their grandfather, not their father. Talk about a generation gap!

On the positive side, you'll probably find a surprising percentage of your ham club members have children or grandchildren (and probably great-grandchildren) in the 10–15-year range we're looking for. Fine—get them to come with gramps to a meeting. Club meeting posters in the local schools may help bring out a few volunteers, too. Check with Boy Scout and 4-H Clubs in your area, both prime sources of potential hams.

News flash: The club meeting darned well better be interesting. Kids have little tolerance for business meetings or trying to deal with a bunch of grandfathers. And no, a code class isn't going to be greeted with open arms. So what can you do to get them to keep coming back?

How about taking off your Pooh-Bah mask and talking with them just as if they were actual people. Find out what they know about amateur radio so far. Find out what aspects, if any, interest them. Have they ever visited a ham station and talked over the air? Do they understand about repeaters? Packet? Give them attention—make them comfortable—show an interest in them personally.

"Work your way through a Novice license study manual with the kids—if you have anyone in the club who actually passed his license exam honestly."

I've visited many clubs where I've seen the old-timers ignoring the youngsters—just talking with their old friends. Then they badmouth the kids because they drop out after a couple meetings.

I knew a ham who had it down cold. He could stop newcomers dead in their tracks and put them off ham radio for life. Sure, kids—even the dumbest of them—know they have to learn the damned code. Well, this joker would invite youngsters over to his shack, make two or three high-speed CW contacts, then wake up the sleeping kids and thank them for coming. That was the last anyone ever saw of 'em.

You'll find that most kids are fairly used to using their voice to communicate, so demonstrating a bug or even a computer keyboard may not be the best way to reach their innocent hearts. Try some DX voice contacts. Don't try to impress them with a crummy signal report swap with a rare country. Just stick to something easy where you can talk without too much interference and allow them to get on the mike.

If you start getting your club involved in some fun projects, that'll help kindle kid interest. Your club might provide communications for a car rally—a marathon—a sporting event—act as runners for a charity telethon. Not only will the kids do most of the actual leg work involved, they'll love it and be back for more.

How about antenna and tower-raising parties? Have you thought of organizing club trips to an observatory, a nearby FAA center, a local electronic plant? Club activities such as picnics, flea markets, auctions, and hamfests all need lots of energetic youngster help.

Once you have your junior auxiliary going, you'll want to get them started on their ham tickets. Yes, they have to learn the stupid code, but you'll find them much more enthused over learning the basics of radio and electronic theory and learning the rules and regulations.

Can you get them interested in trying a simple building project? Perhaps you can find one in *73* where there is an available parts kit which they'll enjoy. Getting the right parts is a bear today, so we try to help by organizing parts kits for most of the easier *73* construction projects.

Demonstrations at club meetings of new ham technologies such as packet radio, OSCAR contacts, RTTY, SSTV, and so on will pack 'em in. It isn't going to hurt with the older club members either—even the oldest hams eventually get bored with long business meetings and politics.

As I've pointed out before, club meetings are show biz, so get the business done with the executive committee. Old fa. . .timers will love being made directors of the club, so let them have business meetings to their poor old hearts' delight and don't drive the kids away from the regular meetings with boring business.

Does your club have a repeater? You might want to get *Westlink* every week and broadcast the news—with a check-in for members afterwards. The *W5YI Report* is also interesting. Subscribe to both.

How about a half-hour pre-club meeting for license study discussions? Work your way through a Novice license study manual with them—if you have anyone in the club who actually passed his license exam honestly. Of course if everyone Bashed their way into the hobby you may have a problem finding someone with an understanding of electronic fundamentals. I did an audio tape Novice theory series years ago—sold well. Maybe I should sit down in front of a video camera and do it over again.

I've seen some recent attempts at video instruction, but they were incredible bores. You need someone with some fire—enthusiasm—and no fear of the camera. I eat TV cameras for lunch—and the bigger the group I'm addressing, the more fun it is for me. Learning must be fun if it's going to work, so find someone who knows his stuff and can make it fun.

Getting kids interested in amateur radio enough to get their Novice license is the first step. Once they are started, it's up to your club to goad them into getting on the air and upgrading to a General. Don't let 'em get stuck in that ham backwater, the Tech license.

Help 'em put up antennas. Make skeds with them. We lose most kids even before they become Novices, but we've been losing a hefty percentage of our Novices through plain neglect.

Okay, there are some of the basics. Now I want to get some letters from you telling me what you've done to interest youngsters in coming to your club meetings. Let me know what has worked for you.■

FUN!

Number 16 on your Feedback card

John Edwards KI2U
PO Box 73
Middle Village NY 11379

CALLSIGNS

All this talk about callsigns really has my adrenaline flowing.

At the time I'm writing this column, the FCC was thinking of turning its call assignment mechanism over to a private organization (presumably the ARRL). When this happens (if it hasn't already occurred by the time you read this), we will all be able, for a fee, to choose our own callsigns. Whoopee!

Few of us care what our social security number is or what's imprinted on our Visas or Mastercards. We hams, however, have a never-ending concern about our callsigns. It's our on-air persona. I mean, who wants to enter a pileup with a call like KB7LID? Not me, although I can think of some people I'd like to give such a call to.

I would sure like to get rid of KI2U, and I sorely regret the day I traded in WB2IBE. Do you know how many people—hams included—have looked at my callsign badge at a flea market and called me K-12-U? Or K1ZU? Too many.

I can well remember the day I got my first callsign. Unlike most hams, I didn't find out from the FCC. No, that would have been too simple. For me, the bearer of the glad tidings was The Little Print Shop, in Austin, Texas, QSL card maker extraordinaire.

I don't know how the LPS does it, but I believe they can find out your Novice callsign even before you take the test. I think about a third of the hams in America found out they passed their Novice test from those Texas pasteboard makers. In my case, the LPS performed a real public service, since the FCC had royally screwed up my license. I didn't receive my official ticket until some six weeks after my LPS "notification." It didn't really make a big difference, though. I just pasted one of those sample LPS QSLs on my shack's wall and began pounding brass. My brother put a gold star on the card to make it official.

> **"I mean, who wants to enter a pileup with a call like KB7LID?"**

Remember the days when Extras could request a specific 1-by-2 call? Back in 1977, WA2MJK and I tried to upgrade to Extra just so we could request K2VD and W2VD. Socially contagious callsigns. We failed, as Mitchell K. Collinsworth and Michael Ross—the current holders of those calls—can attest.

I'm not sure what call I would request if given the opportunity. I know it couldn't be anything off-color, since the ARRL just wouldn't stand for that. A FUN suffix would be nice, but people might expect every QSO to be a "laff riot." I don't know if I could live up to the promise.

On the other hand, I could always get WB2IBE back. The IBE suffix had a nice ring on CW: di dit, dah di di dit, dit. But then, I'm not on CW much these days.

Or, here's an idea that will drive your best ham friend crazy: Get his old callsign. Maybe I'll snag WA2MJK's Novice call, WN2ZFF. I wonder what AF2M would think if I took his old call, WB2MMR. Heh-heh. Hey, don't anybody take WB2IBE while I'm still thinking about it, okay?

Along the same line, I wonder if they would let me retrieve an "infamous" callsign from the past, like a call once held by Crazy Pat Sherrill or Kool-Aid Jim Jones. You have to admit, with a call once owned by fellas like that, you'll always have a story to open a QSO with.

At this point, perhaps I should ask you, my radio audience, to suggest a replacement call for KI2U. Okay, I'll do it. Do you have a callsign idea for me? (Please no W2FAT suggestions; I'm a bit sensitive about that.) If you have an idea, send it to me at the address at the top of this column, and I'll give your call proposal due consideration.

Hey, there's an idea! K6DUE. Nah, it's been taken.■

ABOVE AND BEYOND

Number 13 on your Feedback card

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LINEAR TRANSVERTERS

This month I'd like to touch on a previous topic that might benefit from further discussion. This topic is the theory and operation of linear transverters, since a great deal of misconceptions exist regarding these devices and how they work. I've also seen many examples of improper use and subsequent damage of transverters, largely due to these same misconceptions.

Let's get down to basics: A linear transverter is probably the simplest way to get a signal on the VHF and UHF bands. By definition, a linear transverter is a transmit and receive converter with all appropriate switching contained in one circuit, capable of upconverting rf signals from and downconverting to an intermediate frequency in a linear fashion. Seems easy enough!

Fig. 1 illustrates the typical block diagram of a transverter. The circuit scheme is quite simple, using a local oscillator (LO), transmit mixer, transmit rf amplifier(s), receive mixer, and receive rf amplifier. Some sort of transceive switching is usually employed on board at both the intermediate frequency and the desired conversion frequency.

If you wanted to build the simplest transverter possible, all you'd really need would be the LO, the transmit mixer, and the receive mixer. This would encompass three active devices, all of which could be FETs in this example. Let's say you'd want to convert 28-MHz signals to 50 MHz on transmit, and convert 50 MHz to 28 MHz on receive. The first step would be to determine the correct LO frequency, which would be 50 − 28 = 22 MHz. A JFET oscillator using an MPF102 or J310 could be constructed to run at 22 MHz, using a third overtone crystal.

Next, you'd need a way to mix that signal with a 28-MHz source to yield the desired 50-MHz frequency. A 3N204 MOSFET would work well here, with its output circuit tuned to 50 MHz. Since the 3N204 is a dual-gate MOSFET, it is ideal for mixing two signal sources. Since it is a high-impedance device, you'll be able to work with low-level LO and i-f sources. And its performance will also be fairly linear.

Finally, you'll need a way to mix 50-MHz received signals with the LO to come up with the i-f again, so another 3N204 is selected for much the same reasons as in the TX mixer. This device has a fairly good noise figure and lots of gain at 6 meters. The completed bare-bones transverter is shown in Fig. 2.

Great! The whole thing can fit in a small case and run off a 9-volt battery. The only problem is that you might want to run a bit more power output on transmit. And you'd like a bit more signal to work with on receive as well. Time to add rf amplifiers, such as VHF silicon bipolar transistors (examples: 2N2369, 2N4427) after the TX mixer, bringing you up to the .5-Watt level. And another 3N204 rf amplifier ahead of the rf mixer to improve sensitivity. Now we've progressed to Fig. 3.

Still not satisfied? How about yet more power at 50 MHz, by adding two stud- or flange-mount rf power devices (2N6080, 2N6082) to bring the output up to 10 Watts? Better put them in their own shielded case as well. As a matter of fact, why not add some sort of simple transceive switching scheme using diodes, transistors, and a relay? Put the whole thing in a case with the necessary connectors, and we've moved to Fig. 4.

Remember that the core function of the transverter hasn't changed one iota with all of the add-ons. You still have a transmit mixer, receive mixer, and local oscillator doing most of the work, and you have them doing it at very low signal levels. This is probably the one concept most amateurs have trouble with regarding transverters! The power required to make the receive mixer work is infinitesimal. Consider that a typical signal at 50 MHz might be .2 uV, or about −120 dBm. The receive rf amplifier stage will probably kick this up about 16 dB or so to −104 dBm, or a bit over 1 microvolt. The RX mixer will add about 14 dB in conversion, making the total conversion gain 28 dB and presenting a signal to your i-f receiver of about −90 dBm, or 7 uV.

On transmit, it's very much the same. Most linear transverters use two MOSFETs in a dual-balanced mixer scheme to improve linearity, but they need very little in the way of i-f excitation to do their job. Consider the typical transverter with four active stages of rf amplification, running 10 Watts output. Such a transverter might only need a signal level of 0 dBm, or 1 milliwatt, to achieve full rated power, and most commercially made transverters on the market today operate in that power range. The conversion gain through the transmit section is then 40 dB from 1 mW to 10 W.

You'll also find that driving the TX mixers with much more than 1 mW will yield no additional output, and at this point the TX mixer is saturated. When saturation occurs, the TX mixer is at the end of its linear mode of operation, so more drive will result in spurious mixing products and distortion of the original waveform. This is why most transverters have on-board attenuator networks, usually resistive. These attenuators allow up to 300–500 mW of energy to be applied without significant harm to the TX mixer stage.

Higher drive levels require more attenuation to dissipate the excess drive, and such attenuators are available in up to 15-dB, 10-Watt models most frequently used with 144-MHz multimode transceivers. I've often seen transverters for 432, 1296, and higher damaged because the user forgot to incorporate the external high-power attenuator and applied 10 Watts across 300 mW of resistors, destroying them and the TX mixer stages (sometimes even the RX mixer as well)!

You could conceivably build a high-power linear transverter using a power tube, such as a 4CX250B, and drive it with a few Watts of energy at the i-f and a few Watts of LO injection, but this would be a bit impractical because of size and power requirements! Indeed, early linear transverters used balanced-mixer tubes such as the 7360 to get up to VHF frequencies with a few Watts of i-f excitation.

The important thing to remember is that properly designed transverters are linear devices. After all, we've just seen that they are essentially mixers with add-ons! That means that any type of i-f signal can be reproduced faithfully at the desired transmit frequency, and any type of received signal can be downconverted. AM, FM, SSB, CW, RTTY, ATV. . . it makes no difference to the transverter! This is why I've long favored using transverters with HF radios for superior VHF and UHF operation, instead of costly multimodes. Why spend all of that extra money when the linear transverter does its job so well, so simply, and so inexpensively?

Remember, too, that the linear

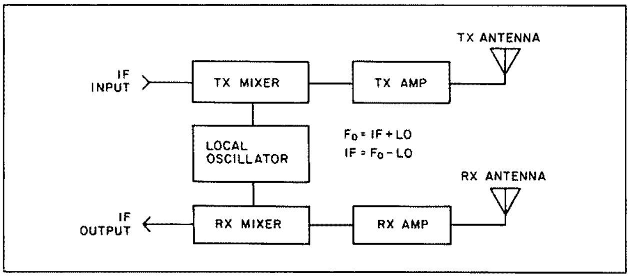

Fig. 1. Block diagram of a typical transverter. Pin diode or relay switching is often used between the TX and RX antenna.

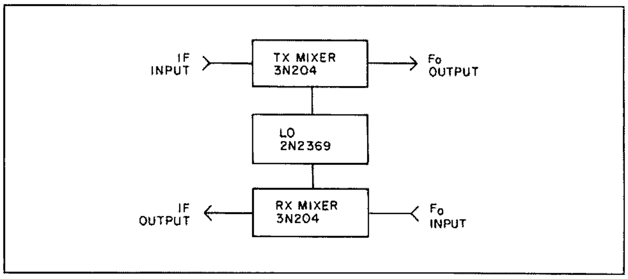

Fig. 2. Here is the simplest form a transverter can take—two mixers and a local oscillator (LO).

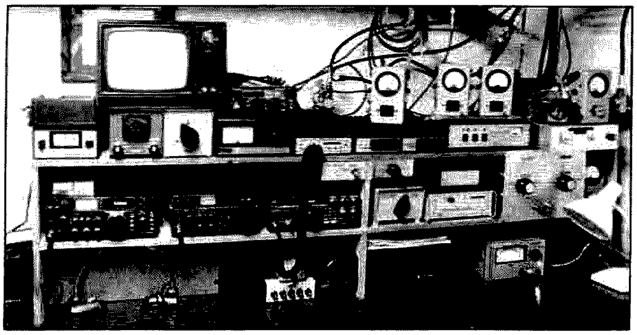

Photo A. Here's a front view of the operating position at KT2B. HF transceivers and VHF exciters are on the left side, while transverters and VHF/UHF amplifiers are on the right.

transverter allows you to employ all of the bells and whistles on your HF rig, such as filter options, scanning, dual vfo's, even general-coverage receiver options! One ham I know uses his 2-meter transverter and TS-430S in AM mode to listen to the local airport transmissions in the 130-MHz range.

Thanksgiving Openings

Checking the mailbag, Mike Rhodes W8DN of Celina, Ohio, writes in to talk about the openings experienced throughout parts of the country last Thanksgiving (of all times!). Mike is active on both 2 meters and 70 cm using an ICOM 745 and Microwave Modules MMT-144/28R and MMT-432/28S linear transverters. (How appropriate!) In Mike's words, ". . . I thought you might be trying to compile a pattern for the Thanksgiving Day VHF/UHF openings so here is an extract from my log. . . I was unaware of the opening until late Thursday evening after the holiday guests had left. It was just plain luck that I even bothered to turn on the rig! [That's the way it usually happens, Mike!]. . . Boy, am I glad I did! I'm a newcomer to VHF/UHF (except 2m FM). . . . This was my first real opening. What a beaut!"

Mike goes on to discuss his observations regarding the power needed to make consistent contacts, especially on 432 where he found that 40 Watts was all he needed to bag QSOs in EN93 (Ontario), EM15 (Oklahoma City), EM28 (Kansas), EM35 (Arkansas), FN20 (New Jersey), and FN02 (New York), among others. Mike, it looks as if you were busier than a one-armed paperhanger! He also observes that the 25 Watts on 2 meters was a little less than he needed to get through the "20-meter-like pileups on 144.200 MHz!" This has long been a problem on 2, and it doesn't make much sense considering how much bandwidth there is to use.

Yours truly was busy nursing a cold and visiting relatives in Vermont and found out about the opening after I returned home. Of course, I've always maintained that all I have to do to make 2 meters open up is go on vacation with no equipment. It never fails. I appreciate your input, Mike, and ask other readers with evidence of this sustained tropo opening to send along some logs or anecdotes. And we thought all the good propagation was over by November 1!

UPDATE

Charles Osborne WD4MBK of the Southeastern VHF Society has computed the correct coaxial balun length for KLM's 144- and 220-MHz antennas (using RG-142 Teflon™ coax). For 144 MHz, the length should be 31.6 inches shield to shield. For 220 the length should be 20.75 inches shield to shield. Add one-half inch to each end to allow enough wire to go to the spade lugs.

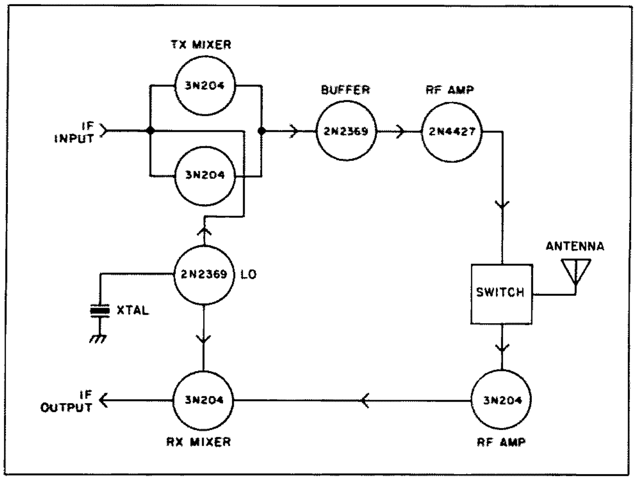

Fig. 3. We've now added a buffer amplifier and rf amplifier to the TX line, as well as an rf amplifier to the RX line and a TX/RX switch.

COMING UP

Several interesting items have arrived at the shack lately for review purposes, among them the Kenwood TS-711A (yes, I'm finally getting around to reviewing it!), ICOM IC-275 mobile multimode, SSB Electronics LT33S 902-MHz transverter, Microwave Modules 50/28R 50-MHz transverter, and yagis for 144 and 902 MHz from Tonna. I've even heard rumors that a new Yaesu 727 dual-band HT is on the way as well. One thing is certain: I won't run out of VHF and UHF equipment to review in the near future.

I'd like to hear your input on some of these items if you are already using them in your station! Feel free to drop me a note and list any observations you have—likes, dislikes, whatever. In fact, I'd like to hear more about your station and operating habits—favorite bands, equipment, interesting contacts, and the like. Send along photos if you have them, ideally black-and-white prints.

In that vein, I'll show a recent shot taken of my station which I recently remodeled, adding sheetrock walls and insulation to make it look nicer and stay warmer in the wintertime. To the left side of the picture, you'll notice an IC-740, an IC-551D, and a TS-430S. The 551D is on loan from Mike Crawford WA2VUN, but the IC-740 and TS-430S are my workhorse rigs. The 740 finds most of its use on HF (yes, I actually operate those bands, too!), while the 430 serves as a transverter driver through the switch panel to the extreme right.

Transverters are employed on 2, 220, 432, and 1296 from the switch panel. A fifth position brings the 28-MHz XMIT and RCVR lines to front-panel BNC jacks for bench-testing purposes. Solid-state amplifiers run 200 Watts on 2, 120 Watts on 220, and 130 Watts on 432, with a single

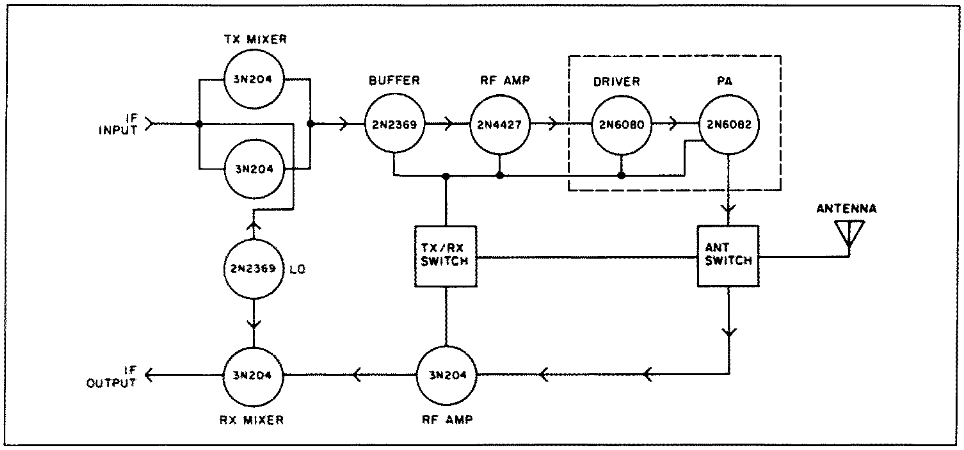

Fig. 4. Now we've added a driver and PA stage, as well as transceive switching.

3CX100 tube running 80 Watts on 1296. Yes, I like Bird wattmeters, before you ask. Below, the main power supply is an Astron RS35. Next to that is the Boonton 92 rf millivoltmeter, and next to that a Bird 600-Watt dry dummy load.

Cables pass through a special plywood window panel and are supported with an elastic shock cord. The shelf brackets originally were designed to hang plants from, but they make great test cable holders as you can see. Overhead multi-drawer storage cabinets facilitate parts storage, and I've got plenty of spare parts for every type of application including spare FETs for preamps, which I used to blow up quite regularly years ago. I also added a phone, which is very helpful during contests!

The television usually sits upstairs, but I was busy repairing some equipment and watching a football game when the shot was taken, using my Cushcraft 32-19 Boomer as a television antenna on channel 7. It works great, by the way! Just out of the picture to the left is a 6-foot rack cabinet, with the Hewlett-Packard 608F signal generator; 14-volt, 15-Amp supply; 1-kW, 144-MHz amplifier; 300-Watt, 432-MHz amplifier; and 2000-volt, 1-Amp power supply for contest work.

All of these rigs feed the following antennas: on 160 and 80 meters, a B&W ac 1.8–30 wire antenna. On 40 meters, a bazooka, and on 20-15-10, a Cushcraft R3 vertical. On 50 MHz, I use a KLM 7-element yagi @ 40'; on 144 MHz, a Cushcraft 32-19 @ 50'; on 220 MHz, a KLM 14-element yagi @ 55'; on 432 MHz, a Tonna 21-element yagi @ 45'; and finally, on 1296 MHz, four 23-element Tonna yagis in an H-frame @ 58'. I employ 7/8" hardline at 1296; 1/2" hardline at 432; and 9913 at 220, 144, and 50 MHz.

That's it for this month! See you in April, Above and Beyond! ■

LOOKING WEST

Number 19 on your Feedback card

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PIRATE COORDINATION VS. THE FCC

Establishing your own repeater council to lend an air of legitimacy to an uncoordinated repeater can place you in jeopardy of FCC sanction if that system causes even the slightest interference to a legitimate and recognized repeater in that geographic area. This is according to FCC Special Services Division Chief Raymond A. Kowalski, who issued a letter of interpretation of the revised amateur repeater regulations as set forth in the Report & Order on PR Docket 85-22.

The interpretation comes as an answer to an informational request filed before the commission by ARRL VHF Repeater Advisory Committee Chairman Joe Eisenberg WAØWRI of Lincoln, Nebraska. Eisenberg, who also serves as Nebraska State Frequency Coordinator and as the Nebraska representative to the multi-state umbrella organization called MACC (the Mid-America Coordination Council), had been asked to help arbitrate a long-standing dispute between a local frequency coordinator serving the Kansas City area and the two statewide councils serving Kansas and Missouri. The latter had claimed the right to handle coordination for the Kansas City area on a shared basis, since the city lies on the Missouri River and is therefore divided between the two states.

Both statewide councils refused to recognize the work of a local Kansas City area frequency coordinator who had been performing repeater coordination for many years and who had the backing of the local radio club council. As discussions between the two opposing factions had brought no result, Eisenberg decided to obtain guidance from the FCC; he presented them a list of facts and issues as professed by both sides.

Bureau Chief Kowalski explained to *Westlink Report* that the FCC could not interpret its own rules to satisfy any one particular case. Its interpretation, while citing the situation in Kansas City as a specific, in fact, affects all amateurs, all repeaters, and all repeater councils.

We spoke with Ray by phone, and he gave *Westlink Report* the gist of what his letter to Eisenberg said: "When the FCC enacted PR Docket 85-22, it said, 'We encourage local coordinators to participate in a regional or umbrella entity.' Our letter of November 13 interprets that language to mean that where there is a regional entity—as there is in the Missouri and Kansas areas, which have in fact determined who the rightful coordinator is in Kansas City—then that is the rightful coordinator, and people who operate with coordination from anyone else do so at their peril. It is the licensees of the repeaters, not the coordinator or bogus coordinator, who are risking sanctions if interference occurs."

We asked Kowalski if this action were aimed at ridding amateur radio of the many pirate coordination councils that have been springing up of late to challenge the long-established and bona fide repeater coordination operations and spectrum management entities in various cities nationwide. "The mechanism for making them go away is that they are exposing other people to jeopardy," said the FCC Bureau Chief, "and we are not going to hear of other people saying, 'Well, how did I know?' We are putting them [all amateurs] on notice right now!"

How can you tell who is and who is not a valid frequency coordinator for your geographic area? The simplest method at this time is to consult the latest issue of the ARRL *Repeater Directory*. While not an absolute bible as to who is who in frequency coordination, it is the most accurate listing to date, and according to Bart Jahnke KB9NM, who serves as its editor, the League takes as many precautions as are humanly possible to ensure the accuracy of this publication.

Westlink Report contacted Jahnke and asked several questions pertaining to the way in which such listings are developed. KB9NM replied that the *Repeater Directory* lists only repeater coordinators that it knows exist and that are active. In the case in which a regional coordination body exists (as favored by the FCC in PR Docket 85-22), the *Repeater Directory* mentions the local council(s) recognized by such a body.

Where one repeater council or coordinator has been replaced by another, the *Repeater Directory* attempts to obtain, by confirmation in writing, the current coordinator's identity. Additionally, "made-to-order" coordination councils are not recognized unless (a) the area in which they claim to coordinate has been proven to be vacated by a previous coordinator or (b) the proper election has taken place by either the general amateur population or by the owners/trustees of ALL repeaters that fall under that jurisdiction. Jahnke added that "the ARRL attempts to authenticate the validity of any and all coordinators/councils that it lists in the *Repeater Directory*. These listings are generated with the best information available to us at that time."

Does the FCC recognize coordinators and councils listed in the ARRL *Repeater Directory* as being the "official entities" of given geographic regions? Bureau Chief Kowalski notes: "The statements that were made about it (by FCC officials two to three years ago) were made at a time when the ARRL *Repeater Directory* was the only thing there was as far as a listing of coordinated repeaters. But, since that time, PR 85-22 has come out, and since that time the amateur radio community has begun to explore the notion of regional councils, of umbrella organizations, and they have begun to explore the idea of a nationwide data base. So, I would not say that the fact that you [a repeater] appear in the ARRL *Repeater Directory* has the same weight that it had, say, two years ago, but, on the other hand, it still is a good indication (to the FCC) that this repeater is coordinated, and at least it is a place where, until something better comes along, coordinators can look to see if there is anybody on a particular frequency.

"It [the ARRL *Repeater Directory*] is the kind of thing that someone says, 'Well, wait a minute. This stray coordinator has come along and coordinated somebody on this frequency, but I can produce lists going way back some 10 years (including listing in the ARRL *Directory*) that show that I have been there all of the time and that anybody who is looking to coordinate (a new repeater) could have looked it up in this well-known source.' So I think that it [the ARRL *Repeater Directory*] indeed does carry a lot of weight."

What can a repeater coordination council that feels it is truly the rightful representative of a given

area do if it thinks that it has been treated unjustly by a larger regionwide or another existing coordinator/council? Kowalski suggests that using the electoral process might be a solution, but he also notes that such an election must include ALL amateurs of a given geographic region and not just those hams who serve on repeater councils or who own repeaters.

Who would bear the cost of such an election? That he cannot say. But, an election of this type would necessarily include the costs of printing and distributing secret mail-in ballots, an independent "Committee of Tellers" (probably located out of that region to provide election security to count the votes), an agency willing to lend its support to certify the outcome so that it could not later be challenged in court, and the rest of what goes into holding such an above-board election. All of these costs would probably fall to the challenging coordinator, since the established coordination body has no reason to spend its funds on such an election, and the ARRL has made it clear that it intends to "stand clear" of the political aspects of the repeater coordination and spectrum management process.

The letter of interpretation sent to VRAC Chairman Eisenberg, along with the very tight guidelines established by the ARRL to obtain a "Coordinators' Listing" in the ARRL *Repeater Directory* as outlined above, means, in reality, that a self-professed pirate frequency coordinator will not be recognized by either the FCC or the ARRL, and that those repeaters who try to evade the regulation of an established and recognized coordinator face the prospect of severe sanctions and penalties if their operation causes harm to a coordinated operation. It also means that if a repeater coordinator says that "the band is full and there is no room for your new repeater because it will interfere with already existing machines," then you had best not even consider putting it up.

Thanks to VRAC Chairman Eisenberg, the word of a frequency coordinator now appears to hold the weight of FCC regulation. To again quote Division Chief Ray Kowalski: "That ought to go a long way toward strengthening and putting teeth into what the commission said as far as how you tell the rightful coordinators. We [the FCC] are not going to put up with 'fly-by-night' pirate coordinators!" ■

QRP

Number 24 on your Feedback card

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DAYTON SCOOP

As I promised last month, I'm going to scoop everyone with news of the Dayton Hamvention '87. But, before I go on with the plans for '87, I'll look back at Dayton Hamvention '86.

The Belton Inn provided us with the 10th and 11th floors. Things started to cook on Thursday with Jim Fitton setting up the hospitality suite. After dining out on pasta, the group returned to the hospitality suite and talked about antennas, with Brice Anderson W9PNE showing off his waist-high 30-to-10-meter micro-loop antenna. This job was the sequel to his last Field Day experiments.

The fact that one table was covered with some of the best-looking home-brew gear I have ever seen was worth the trip to the hospitality suite. With those small backpack rigs lying on the table and with the micro antenna present, well just guess what we did? Seemed as if we loaded up everything within reach of the radios.

I sure would like to know what that one guy was doing with our antenna sinker on the 3rd floor. Every time we dropped the antenna out over the patio and down the side of the hotel, someone would cut off the wire the weight was on. Good thing the weights were empty cans of beer!

The main QRP booth was manned by Leo KC5EV, and Jim KK7C took control of the flea market spot. Membership sign-up sheets were at both locations.

Now I can understand why everyone in W6-land is laid-back. Bob W6SQK led more than 35 of us through the back alleys of downtown Dayton looking for our banquet hall. After eight blocks of walking, we finally made it. Wits in place of Watts, that's what it took to communicate with each other at the banquet. Much fun was had by all. Back at the hotel, some chest pounding—about the best DX, Field Days, antennas, and such—was exchanged till the wee hours of morning.

Photo A. Close-up view of the backpack special. Notice the two batteries to the right.

Saturday at about 4 p.m. we had an official QRP ARCI meeting. Since I am on the Board of Directors, I discussed issues that helped determine the direction of the club for the coming year. We lacked one member to have a quorum. Issues that had to be voted on were done so via the mail.

That evening, many well-known QRPers showed up, including Adrian Weiss WØRSP, Chris Page G4BUE, Jerry Trotten K8IRO, Les Shattuck W2IPX, and Jim Fitton W1FMR. Several awards were given out to individuals recognizing their efforts in QRP.

The QRP forum started Sunday morning. Chris Page was speaking on QRP in the UK. I knew he would have been a hard act to follow, so I started off the forum with a talk on my favorite subject—solar energy and QRP. Then Chris gave his talk, and Les Shattuck discussed the direction of the club. Ade Weiss tied things all together with a question and answer session. What a time we had—more than three hours spent talking QRP.

That was last year. What can you expect this time? Well more of the same, only better. First things first. We again will be staying in the Belton Inn in downtown Dayton. Once more Jim Fitton will be taking care of the rooms. I urge you to call Jim at (617)-374-3594 for more information. Collect calls will be answered by his cat, Fred. If you want, write to Jim at PO Box 58, Ward Hill MA 01830. Remember, I write this in early December, so the rooms may be very close to being gone by now. Rates will be about 35–40 bucks for a double room. Jim will be able to give you more updated information about cost.

This year the QRP ARCI will have a commercial booth set up. This will enable us to sell memberships, books, and perhaps a small kit or two. Do be sure to stop by and say hello.

Bob Spidell W6SKQ will take us on another tour of Dayton after dark—on foot, I'm sure.

If nothing else, stop by and see all the home-brew radios in the hospitality suite. Who says hams don't build? QRP operators do! I have a good feeling that we may see some CCW (Coherent CW) rigs there. Think of it. Running 3 Watts into a longwire with Q5 copy using a Tandy Model 100 and a CCW home-brew rig. It's even more fun if everything is done portable.

Since it is early, I don't know when the QRP forum will be. I do know that I will be giving a talk on home-brewing and solar-powering of QRP rigs. I received a letter from Rev. George Dobbs G3RJV saying that he might make the trip over here with Chris Page this year. If so, it looks as if it will be a very interesting forum.

Photo B. Alan Pike fires up on 40 meters for a few QRP QSOs.

My wife will also be set up with official "Hate Mike Bryce Club" forms. She plans a sellout. Give the kids to Grandma, gas up the ole auto, and make plans for a great weekend filled with good friends, QRP, and good food. Come to the Dayton Hamvention, the "Wright" place to be.

BACKPACKING QRP

I like to operate portable QRP. Alan Pike W8MGF sent me a letter and the photographs shown here. Alan likes to get out and away from it all by backpacking into the boonies and operating QRP. He says:

"I am into backpacking and am a member of a group of guys that go hiking every year. We always take off the first week after Labor Day. It takes some extra selling with the wife, but is well worth the effort. For six days last September we tackled the trail that goes along the shore of Lake Superior, primarily in Pictured Rocks National Park in the upper peninsula of Michigan.

"This year, I decided to make a concerted effort to take ham radio along with me. I packed an MFJ-40T transmitter, a handful of FT-243 crystals for 40 meters, a Kantronics 8040B receiver, a hand key on a piece of masonite, and a dipole cut for 7.040 MHz. Power was two 6-volt lantern batteries wired up to give me 12 volts. Everything except the batteries fit in a small pack which I attached to my backframe.

"At the first campsite, I strung the dipole between a couple of pine trees using 80-lb. test monofilament line and called CQ. My first contact was Mac WB2HCT in Lawtons, New York. My non-ham trail buddies were duly impressed. In the next five days, I logged a little more than 50 contacts in 12 states plus Canada.

"Thunderstorms on the final night shortened my operating time and I quickly took down the dipole. We weathered the storm and walked into Munising, Michigan, the next day. The only thing that got wet was me and the log book. Both dried out fine.

"It was a real kick to sit on a log overlooking Lake Superior, deep in the Michigan woods, and be able to talk to hams all over the Midwest and East. For me, it was a poor man's DXpedition. Hanging around 7.040 was a plus, too. Several hams went the extra distance to pull me through when they discovered I was QRP and on the trail as well.

"I encourage your readers to try combining the accomplishment of backpacking in the boonies with the sport of QRP. It probably is not a bad safety backup either."

Well, I'm impressed. Looks as though Alan is very serious about combining two of his hobbies into one. Any more hikers out there who would like to tell their stories? What is the best antenna to use in the outback? I'm sure that everyone would like to know. I do.

UTC	CW	SSB	Novice
14–16	14.060	14.285	
16–17	21.060	21.385	21.110
17–18	28.060	28.885	28.110
18–19	7.040*	7.285	7.110
19–20	14.060	14.285	
20–21	21.060	21.385	21.110
21–22	28.060	28.885	28.110
22–23	7.040*	7.110	
23–00	14.060**	14.285	
00–01	7.040*	7.285	7.110
01–03	3.560	3.985	3.710

*Some other countries use 7.030.
**Transcontinental QRP Net—Join us!

Table 1. First-Sunday schedules. The QRP ARCI sponsors an informal QSO party the first Sunday of each month at the following times and frequencies. Try CW on the hour and SSB and Novice frequencies on the half hour. Join in to get acquainted with other QRPers.

FIELD DAY

Speaking of operating in the field. The big one is coming. You know, Field Day. I would like to run a special Field Day column, but need your input. Do you have a special "death-ray" antenna? How about your operating secrets? Everyone does some chest pounding when it comes to Field Day. The time is near, so drop me a line, and I'll get it printed up.

QRP ACTIVITY

Several of the letters that I have received ask where they may find active QRP operators. The QRP ARCI sponsors the First-Sunday QSO parties. This is not a contest, but rather an informal get-together to meet with each other and exchange ideas on QRP. Table 1 shows the schedule. Do give it a try.

One more place to look for QRP activity is on 30 meters. Look for QRP CW signals on 10.105 and 10.120 MHz. All are encouraged to call and listen on these frequencies.

MORE TO COME

I plan to have a busy year with the QRP column. Next month I will try and do the Field Day special. Look out for columns on solar power, operating tips, antennas, contesting, and more. As I have said in the past, it is your column. Tell me what you would like to see, and I'll do my best to get it printed. I welcome photographs, just make sure they have a lot of contrast and are in focus. Black-and-white are the best to send, but color ones are fine if they meet the above requirements. Sorry, if I send them in to be printed, you will not get them back. Make copies to send to me.

I try and answer all letters, but I sure would like an SASE. My postage bill is growing out of line. For those who would like to send mail via CompuServe E-mail, my ID number is 73357,222. However it's done, I really appreciate the input. Until next month, enjoy the upcoming spring season and QRP operation.■

HAMSATS

Number 17 on your Feedback card

Andy MacAllister WA5ZIB
2310 Romayor Court
Pearland TX 77581

FANTASTIC

That's how satellite chasing has been since last time. I have made numerous contacts via Radio 5, Radio 7, Fuji-OSCAR 12, and AMSAT-OSCAR 10. I can't guarantee that things will stay this way till this material gets to press, but it brings home an important point about the amateur radio satellite program: Never give up on a hamsat until everybody agrees that the last signals have been heard. Even then, surprises can occur. All of my AO-7 activity (several hundred QSOs) occurred long after the on-board batteries gave out.

Last month I discussed FO-12, other operational hamsats, tracking methods, and projects of the distant future. This month I'll start with updates on our present group of communication spacecraft, follow with some historical perspective on the modes of operation used to communicate through transponder-type satellites, and continue with projections into the near future. These "crystal ball" activities include the proposed frequency plans for the Soviet Radio 9 and Radio 10 satellites as well as the French Arsene satellite.

Updates

Radio 5 and Radio 7 (identified by RS5 and RS7 on their respective CW beacons) have failing batteries. During periods of eclipsing, their operating schedules are severely shortened. I can recall times when nothing was heard for days. When the satellites experience periods of continuous sunlight, though, signals have been great and QSOs are numerous and enjoyable. It doesn't take much to get copyable signals from these satellites. I use a dipole and an HF transceiver with a homebrew preamp to receive the 29.4–29.5-MHz signals.

AO-10 is another satellite that many have already written off. The radiation damage to the on-board memory has made it nearly impossible to uplink even simple commands to the satellite. The command team has worked tirelessly to keep AO-10 useful and in reasonable health. Perhaps it can continue to function until the launch of Phase 3C (AO-10's replacement) later this year. The DX is still out there, but if you find the transponder "ON," use low power and avoid operation around perigee.

FO-12 continues with no problems. Due to the 1500-km altitude and the 50-degree inclination, passes are about as long as Radio 5 and Radio 7 (1660-km altitude). The inclination (angle that the satellite's path makes as it crosses the equator) of FO-12 does allow for a lot of eclipse time—up to 30 percent or as little as zero, depending on the relative positions of the sun, earth, and satellite. Due to power budget constraints, schedule changes will likely be implemented every few months. Presently we have three days of linear transponder activity, two days of "digital," and two days in the recharge mode.

The Modes of OSCAR

Until August of last year, most amateur satellite enthusiasts have had only a few operating "modes." These included mode A via the Soviet Radio satellites with 2m uplinks and 10m downlinks; mode B on AO-10 with 70 cm up and 2m down. Now we add modes "JA" and "JD" via FO-12. Mode JA is a standard linear transponder with 2m up and 70 cm down, while JD is the digital packet transponder. But what is the background of these modes?

The first amateur radio transponder in space was on board OSCAR 3. It was similar to a linear 2m translator with an input at the low end of the band, and output just 1.8 MHz higher. It was a 2m repeater in space. OSCAR 4 had a VHF/UHF transponder with a 2m input and a 70-cm output. It was the first amateur crossband satellite.

Our first long-life satellite was AO-6, using the now-familiar 2m uplink and 10m downlink system. AO-7, launched in 1974, had two transponders and four modes of operation. The modes were logi-

Mode A	
Uplink	145.860–145.900
Downlink	29.360–29.400
CW Beacon	29.402
ROBOT Transponder	
Uplink	145.820
Downlink	29.320

Fig. 1. Proposed transponder configuration for Radio 9.

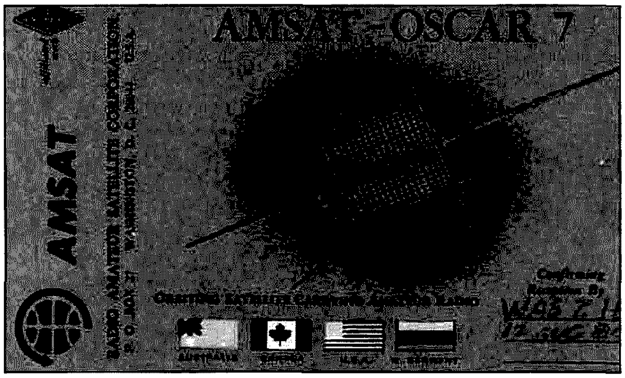


Photo A. AMSAT-OSCAR 7 QSL.

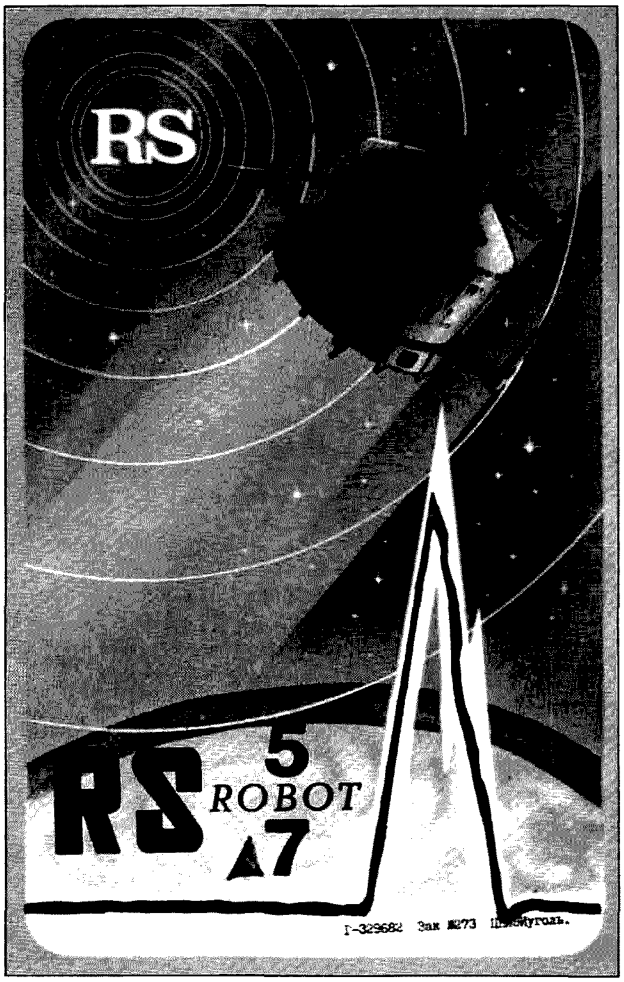


Photo B. Radio 7 QSL for OSO with on-board "ROBOT" in "Cosmic Space."

Mode A	
Uplink	145.960–146.000
Downlink	29.460–29.500
Beacons	29.457
	29.503
Mode K	
Uplink	21.260–21.300
Downlink	29.460–29.500
Mode T	
Uplink	21.260–21.300
Downlink	145.960–145.995
Beacons	145.957
	145.997
ROBOT Transponder	
Uplink	21.140
Downlinks	145.957
	145.997

Fig. 2. Proposed transponder configuration for Radio 10.

Mode B	
Uplink	435.050–435.150
Downlink	145.850–145.950
Beacon	145.830
Mode F	
Uplink	435.050–435.100
Downlink	2448.490–2446.540
Beacon	2446.470

Fig. 3. Proposed transponder configuration for Arsene.

cally called A, B, C, and D and were the output states of two control flip-flops. Significantly, this labeling initiated generic transponder labels. Mode A referred to the 2m to 10m link, B was the 70 cm to 2m system, and C represented the reduced-power B operation. Mode D was simply the battery recharge mode. AO-8 was to be a simple replacement for AO-6, but thanks to JAMSAT (the Japanese affiliate of AMSAT) it also carried a mode J transponder with a 2m uplink and a 70-cm downlink similar in idea to that on board the short-lived OSCAR 4.

The same year AO-8 was launched, two Russian satellites, Radio 1 and Radio 2, were placed into higher-altitude (1,700-km) circular-polar orbits. These were mode A devices and were the first hamsats from the Soviet Union. The receivers were extremely sensitive but were also very susceptible to overload. The transponders didn't last long, but the Radio 1 beacon on 29.4 MHz was heard at times even in 1986, although the CW data is meaningless.

In 1981 we greeted six new Russian satellites from a single launch. Two were 10m beacons (Radio 3 and Radio 4), two had mode A transponders (Radio 6 and Radio 8), but the final two (Radio 5 and Radio 7) had both transponders and on-board "ROBOTs" that made serial-numbered CW QSOs from "Cosmic Space," as the QSLs read.

A year later, ISKRA 2 and ISKRA 3 (student experimental satellites) were deployed from Salyut 7. Neither satellite lasted long—about two months for ISKRA 2 and a little over one month for ISKRA 3. It was the first attempt at mode K, as the Russians called it. The transponders were to have 15m uplinks with 10m downlinks. Although ISKRA 3 had heat problems, an oscillating power regulator, and a blown transistor, some mode K success was reported in Europe, while ISKRA 2 was never commanded out of the beacon mode. The Russian RS series has provided the starting point for many newcomers looking for a taste of satellite activity without making a large commitment of money and time. The satellites functioned quite well with reasonable coverage and reliable operation.

Mode B on AO-10 has offered us a chance to communicate via satellite with others for hours on end. Due to a transponder malfunction, AO-10's mode L (24 cm up and 70 cm down) did not become the new mode of preference. A few hundred stations worldwide managed to achieve the additional 10–15-dB uplink power requirement forced by the failure of a bias regulator in the downlink transmitter. For most, however, mode L remained just a curiosity.

Today we still have occasional operation via Radio 5, Radio 7, and AO-10. With FO-12 in orbit, many long-time satellite enthusiasts have come back on-line, while newcomers are discovering the interesting characteristics of a J-style transponder. FO-12 delights us with a highly functional and fascinating medium for reliable, but short, contacts. We have yet to realize the potential of mode JD, the digital mode on this new satellite. The possibilities are exciting.

Future Hamsats

In mid-June of 1986, the International Frequency Registration Board (IFRB) of the International Telecommunications Union (ITU)

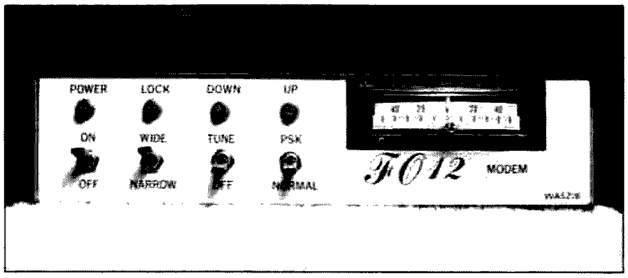


Photo C. Home-brew Fuji-OSCAR 12 modem using the G3RUH circuit board. The modem interfaces the radio to a standard packet TNC for mode "JD."

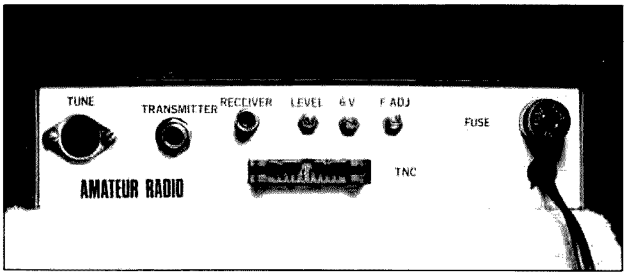


Photo D. Rear view of the FO-12 modem.

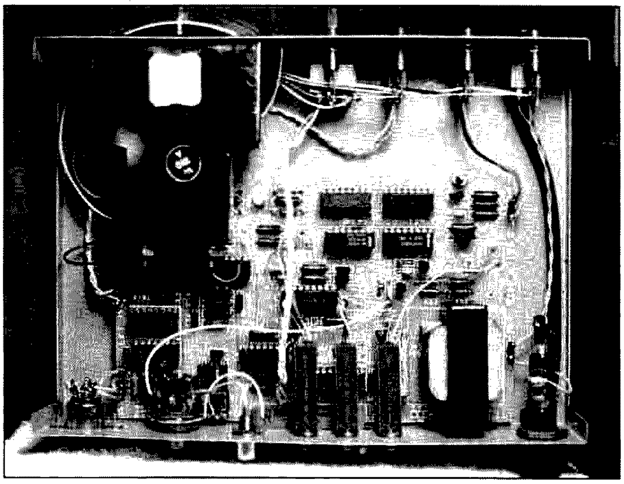


Photo E. Interior view of the FO-12 modem.

received documents from the USSR concerning the proposed launch of two amateur satellites. The information contained orbital parameters, transponder frequencies that might be used, and other receive and transmit characteristics of the spacecraft. The planned orbit is to be inclined 83 degrees at a 1000-km altitude. The inclination is like previous Radio satellites, but the height of the orbit is lower, thus giving a period of about 105 minutes. Recently, specific frequencies have been announced, and according to sources in Europe, the transponder modes, as shown in Figs. 1 and 2, define the Radio 9 and Radio 10 satellites. Note that modes K and T on Radio 10 can operate simultaneously.

Mode K operation has the potential for some very interesting over-the-horizon satellite contacts. When band conditions are good enough to hear the 10m downlink signals while the satellite is over another part of the world, conditions for the 15m uplink are likely to be excellent. Dipole antennas and HF rigs should certainly do the job for most of us. The only problem to watch for is receiver "desense." Listening on 10m while transmitting 100 Watts on 15m can be a real problem when both rigs are in the same room, especially if a preamp is in use. I have found that physical and electrical isolation of the receive system can really help.

Mode T promises to be a very interesting experiment. With a 15m uplink and a 2m downlink, just operating via this mode will be different from the standards of the past. Mobile operation comes to mind since desense will be very simple to eliminate. Downlink signals should be easily heard and free from ignition noise and other man-made interference. The "ROBOT" transponder on Radio 10 also uses the mode T format, another first.

Another satellite that may "take off" in the near future is the French Arsene Project. It was hoped that the French satellite would be launched with Phase 3C later this year, but project delays will postpone Arsene's debut until 1988. Fig. 3 shows the transponder frequencies. Modes B and F use the same uplink frequencies but cannot be in use simultaneously. They will alternate operation. The 100-kHz-wide B transponder is actually composed of four 25-kHz-wide segments, each with an independent agc. This will limit the effects of high-power ground stations (that may cause the transponder to overload) to a single 25-kHz-wide segment of the passband. Arsene is nearly a yard high, a yard wide, and weighs 300 pounds (100 pounds more than AO-10). I'll be reporting more information on this project as the launch date comes closer.

Nets

With new satellites on the horizon and schedule changes to our present hamsats occurring all the time, the AMSAT nets can be invaluable. There are satellite-chaser nets going on somewhere in the world every day, but the most prominent one is the 20m AMSAT International Net every Sunday at 1900 UTC on 14.282 MHz. Others that may be more convenient for your schedule include three Tuesday night 75m nets. The "East Coast" version starts at 9 p.m. (EST or EDT), followed by the "Mid-America" net at 9 p.m. (CST or CDT). The "West Coast" net takes over at 8 p.m. (PST or PDT). There are VHF and UHF nets in many of the larger metropolitan areas, but begin with HF. These nets have been in operation for years and may surprise you with their coverage and information content.

Correction

I gave you a wrong company name last month. NH Enterprises (22104 66th Ave. West, Mountlake Terrace WA 98043) markets an interface for the VIC-20, C-64, and Timex 1000 in conjunction with potentiometer rotators such as the Kenpro KR400/500.

Until next time, good satellite hunting!■

NK6K > PACKET

Number 22 on your Feedback card

Harold Price NK6K
1211 Ford Avenue
Redondo Beach CA 90278

PACKET POLL RESULTS

The Great (or not-so-great) Packet Poll of 1986 is now complete. See the December, 1986, issue if you haven't the slightest idea what I'm talking about. Much to my surprise, most (about 500) of the responses came in via packet radio, and most of them were relayed via the HF forwarding system. Fortunately, the 14.109 system was in place when all this started; otherwise, there would have been a real mess. I discussed some of the logistics last month.

Some Stats on the Stats

There were 601 responses total; 63 came in on paper via the mail. There were 330K bytes of data in the messages received via packet; most of that was header lines.

The raw results are below. I'll provide more commentary next month. Note that as with most computer rounding, the percentages won't add up to 100%. Also, some things will show up as 0% even though there were some responses in that area.

Also contributing to the total for a question is the "no answer" or "other" responses. For questions where this answer was large, I'll make a special note.

A large number of BBS sysops answered the poll, 26% of the total responses in fact. This number may be out of sync with the true proportion of BBS sysops in the total packet population. For this reason, I've included three columns of responses; the first is for the entire group of those responding, the next is for those not claiming to run a BBS or a digipeater, the third number is for those running a BBS. I have not shown the digipeater owners separately.

For an example of why this is important, look at question 12: 94% of the sysops have a radio dedicated to packet, but only 58% of the non-sysops do. The figure for everyone (including digipeater owners) is 70%. On the other hand, no matter how you interpret this, a significant number of users have a radio dedicated to packet. Maybe the rest are in the market for one. (Any manufacturers reading this?)

When there was more than one answer in the response to a question, only the first one was tabulated.

There were a total of 601 responses—373 in the not-BBS category and 127 in the BBS sysop group. The rest were digipeater owners.

As I said last month, special thanks go to the BBS ops who forwarded responses to me, and who forwarded my acknowledgments back, and in particular to WB6KAJ.

	Total	Non-BBS	BBS
1) Sex:			
A) Male	96%	95%	98%
B) Female	3%	4%	1%
2) Age:			
A) 15 or below	0%	1%	0%
B) 16–21	2%	2%	2%
C) 22–39	46%	46%	47%
D) 40–59	42%	39%	46%
E) 60 and up	9%	12%	5%
(Packet isn't bringing in the younger set as much as I'd hoped it would.)			
3) License class:			
A) Novice	0%	0%	0%
B) Technician	15%	16%	14%
C) General	14%	13%	16%
D) Advanced	35%	35%	39%
E) Extra	33%	35%	28%
4) Number of years licensed:			
A) 1 or less	2%	3%	0%
B) 1–5	13%	17%	7%
C) 6–10	20%	20%	20%
D) 11–20	28%	25%	32%
E) 21 or more	36%	34%	41%
(Sysops seem to have a longer time in grade.)			
5) Year you first used "packet":			
A) Before 1980	1%	1%	1%
B) 1980–1983	13%	8%	25%
C) 1984	16%	11%	31%
D) 1985	28%	28%	28%

E) 1986	42%	52%	15%

(There's a big difference between groups.)

6) I first heard about packet from:

A) Friends/on the local repeater	33%	30%	35%
B) Demo at a club meeting	12%	12%	12%
C) Demo at a convention	7%	6%	7%
D) Demo at Field Day	1%	1%	0%
E) Magazine articles	46%	50%	42%

7) My job is (or used to be):

A) Computer related	40%	40%	43%
B) Rf related	15%	14%	17%
C) Other	44%	46%	38%

(No wonder interfacing with our fellow hams isn't easy sometimes, we've forgotten what they do.)

8) Aside from jawing on the local repeater, has the majority of your amateur radio activities lately been packet-related?

A) Yes	79%	72%	94%
B) No	20%	27%	6%

9) Number of TNCs owned:

A) 1	58%	77%	19%
B) 2	22%	17%	28%
C) 3	10%	3%	30%
D) Many	9%	3%	23%

10) Do you use the AX.25 protocol?

A) Yes	98%	97%	99%
B) No	2%	3%	0%

11) Are you running (or do you also run) a protocol other than AX.25? (Also answer yes if you are pushing IP or other protocols through AX.25 UI frames.)

A) Yes	10%	8%	20%
B) No	89%	91%	80%

12) Do you have a radio devoted exclusively to packet?

A) Yes	70%	58%	94%
B) No	29%	41%	6%

13) Do you run a digipeater or other digital repeater where that station is up 24 hours a day and its primary purpose is to relay data for others? (Don't answer yes if you simply have DIGI ON set in your TNC.)

A) Yes	26%	0%	54%
B) No	73%	100%	46%

14) If you run a HOST/BBS system, do you:

A) Run a WØRLI or RLI-clone BBS	17%	0%	81%
B) Run a BBS that can forward to/from RLI systems	2%	0%	9%
C) Run a different type of BBS	2%	0%	10%
D) Do not run a BBS	74%	94%	0%
E) Other	4%		

15) Where do you use packet?

A) Mostly on VHF	81%	84%	71%
B) Mostly HF	2%	2%	4%
C) HF and VHF	16%	12%	25%

16) Your packet operation is:

A) Mostly real-time person-to-person chats	12%	16%	3%
B) Mostly BBS messaging/ file transfer	29%	23%	57%
C) Both	58%	61%	39%

17) Do you have a forwarding BBS (RLI-style) in reasonable range of your station (one or two hops)?

A) Yes	94%	93%	100%
B) No	5%	6%	0%

(Of course, this poll was more easily answered by hams with access to a BBS.)

18) Do you frequently use the forwarding feature of your local BBS?

A) Yes	52%	39%	90%
B) No	47%	60%	10%

19) Have you built or designed anything for packet, for your own use or others? This includes hardware (TNCs, modems, connect alarms, tuning indicators, etc.) and software (terminal drivers, BBS systems, etc.). Kits don't count.

A) Yes	46%	38%	63%
B) No	54%	62%	37%

20) Did you put your TNC together from a kit?

A) Yes	38%	30%	62%
B) No	61%	69%	38%

21) Would you be in favor of some type of "digital license," one that gave primarily digital privileges on non-HF frequencies, required a technical test with digital-specific questions, and did not require a Morse-code test?

A) Yes	53%	51%	54%
B) No	45%	47%	46%

22) Would you be in favor of something more than the question above, a "no code" license that gave wider ranging privileges on non-HF frequencies?

A) Yes	33%	33%	36%
B) No	65%	65%	62%

23) Are you against ALL types of codeless license?

A) Yes	37%	38%	36%
B) No	62%	62%	62%

24) Did you get your ham license as a result of hearing about packet radio?

A) Yes	2%	2%	3%
B) No	97%	97%	97%

25) Do you know of anyone who got his license as a result of interest in packet radio?

A) Yes	14%	10%	24%
B) No	86%	89%	76%

(These numbers should be better!)

26) The computer you currently use for packet is:

A) Commodore 64	26%	31%	9%
B) Apple II	6%	6%	2%
C) Z-80/8080-based system (Xerox 820, etc.) and IBM PC/XT/AT and clones	44%	34%	79%
E) Macintosh	3%	4%	2%
F) Dumb terminal	4%	3%	2%
G) Other	15%	20%	2%

(In the version sent out on packet, this question had two C answers. I made the adjustments and merged the IBM PC and Z-80 class for this report.)

27) On the computer you use for packet, do you have:

A) Floppy disk drive	66%	70%	53%
B) Small hard disk (10 meg or less)	5%	3%	11%
C) Large hard disk (greater than 10 meg)	18%	12%	35%
D) No disk storage	10%	13%	2%

28) What do you think about hams who send "digipeater on" beacons?

A) Tar and feather 'em	40%	34%	51%
B) Put 6" steel spikes in their eyes	6%	5%	7%
C) Put bamboo shoots under their fingernails	11%	11%	12%
D) Beacons don't bother you	39%	44%	28%
E) Other	4%	5%	2%

(Most of the A responses were A, B, and C. By the way, this one was sort of a joke. There were really only two answers: "Beacons bother me" and "Beacons don't bother me." Boy did I get a lot of heat on this one.)

29) The "packet network" available in 1986 is:

A) More then you thought it would be when you first got on packet	39%	41%	43%
B) Less than you thought	21%	20%	22%
C) Pretty much what you'd expected	39%	38%	35%

30) Is HF your only link to other packet users?

A) Yes	2%	3%	1%
B) No	97%	95%	98%

31) Is HF your only link to a BBS system?

A) Yes	3%	3%	2%
B) No	96%	95%	97%

32) Most of the data sent on packet today is message text or programs. There are also several other types of data, such as digital audio, digital video, graphics, telemetry, etc. Regarding non-text data:

A) You have used non-text digital communications	14%	13%	18%
B) You would use it if equipment was readily available	64%	63%	64%

C) You have little interest in non-text digital communications	20%	21%	17%
33) Do most of your packets go through a digipeater?			
A) Yes	61%	60%	64%
B) No	38%	39%	35%
34) How many digipeaters can you hit directly? (By digipeater, I mean a device or TNC on the air 24 hours a day with the primary purpose of being a digipeater. Remember to include all the frequencies in use in your area.)			
A) 0–2	23%	24%	18%
B) 3–6	43%	44%	43%
C) 7–12	21%	20%	23%
D) 13 or more	12%	12%	15%
35) How many BBS systems can you hit directly?			
A) 0	20%	21%	11%
B) 1–2	42%	42%	39%
C) 3–6	30%	29%	40%
D) 7 or more	6%	6%	9%
36) How many BBS systems can you hit using no more than one digipeater?			
A) 0	5%	5%	2%
B) 1–2	31%	32%	24%
C) 3–6	40%	40%	43%
D) 7 or more	22%	21%	29%
37) Have you used packet in a public-service activity?			
A) Yes	41%	33%	63%
B) No	58%	66%	36%
38) Do you think the current Part 97 regs on digital communications are:			
A) Too restrictive	39%	35%	56%
B) About right	50%	54%	38%
C) Not restrictive enough	2%	3%	2%
D) Other	9%	8%	5%
39) Is packet a part of your local emergency communications plan?			
A) Yes	43%	40%	54%
B) No	22%	20%	24%
C) Don't know	33%	39%	23%
(Find out!)			
40) In your area, are the packet frequencies:			
A) Too crowded	39%	39%	40%
B) Sparsely populated	15%	15%	13%
C) Just fine	44%	45%	44%
41) In your area, how many VHF frequencies are in active use for packet?			
A) 1	14%	14%	11%
B) 2	23%	23%	20%
C) 3–6	49%	49%	50%
D) More than 6	12%	11%	19%
42) In your area, forwarding BBS systems are:			
A) Using too much channel time	18%	18%	13%
B) Not a problem	78%	78%	84%
C) Other	4%	3%	3%
(Of course, it's tough to answer this one as A) when you're typing the response into a BBS.)			
43) Regarding your packet use, do you:			
A) Use it less than you once did	15%	18%	8%
B) Use it more now than before	41%	34%	58%
C) Stayed the same	42%	45%	34%
D) Dropped it all together	1%	1%	0%
44) Were you a Baudot (RTTY) or AMTOR user before you started on packet?			
A) Yes	47%	42%	60%
B) No	52%	57%	39%
45) Enter the two character post office abbreviation for your province or state (in North America) or your callsign prefix (including number) if you are DX.			
46) You saw this poll:			
A) In *73*	29%	21%	16%
B) On a packet BBS	62%	70%	73%
C) On a phone BBS	5%	3%	7%
D) Other	5%	6%	3%

73 INTERNATIONAL

Number 27 on your Feedback card

NOTES FROM FN42

FIRST: *An apologetic note to our friends in the Federal Republic of Germany. We did not MEAN to give you a new flag last month —a flag with a band of* Grün *instead of* Rot *(our face is like* die rote Rübe*!). We might claim an existentialist approach to colors, and say it was green* vom grünen Tisch aus, *or say that it was green because this magazine is produced* im Grünen. *But we try to get away with something only when we are certain that we can get away with it. The simple fact is that a production error was made—a negative was mislabeled. We are sorry.*

There are five Independence Days in March: Morocco (3rd), Ghana (6th), Tunisia (20th), Greece (25th), and Bangladesh (26th). There are three National Days: in Syria (8th), Grenada (13th), and Malta (31st). Pakistan Day is on the 23rd; Taiwan has its Youth Day on the 29th. And Happy Birthday to Alexander Graham Bell (3rd) and Albert Einstein (14th). So send appropriate greetings and congratulations if you have a timely QSO. (If Mr. Bell or Mr. Einstein QSLs, let us know!)

In recognition of the tenth Pan American Games (to be held in Indianapolis, Indiana, in August) the U.S. Congress has designated 1987 as National Year of the Americas. Any Special Events you have planned will be mentioned here—let us know about them. Send to the Attention of 73 International.

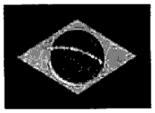
Welcome to Finland! Jukka Kovanen OH3GZ/OH6GZ, QSL and Award Manager for the Finnish Amateur League sends word of Santa Claus Land (and Award) and a new QSL Bureau address (see below) and promises a story of "Peter Pacific trip" with photos for a future column. A one-year subscription will go to Jukka as our foreign correspondent and as Finnish Amateur League official.

ROUNDUP

Canada. The history and equipment of Guglielmo Marconi will be available for public viewing in the middle of this year at Glace Bay, Cape Breton Island, VE1CBF writes—if all goes as scheduled. The "Marconi Museum," funded by the federal parks department and other groups, will open on the site of Marconi's station, where the historic transatlantic message was logged. The Museum will contain a modern, fully operational station equipped for 160 through 2 meters, to be maintained and operated (daily during the Museum's season, it is hoped) by the Sydney Amateur Radio Club. A special callsign has been applied for.

Israel. Next month the Philatelic Service will begin issuing Israel's first postage stamp honoring the amateur radio fraternity. . . Packet comes to Israel and a special newsletter is being written by the Haifa Amateur Group for Digital Communications. Seen as the "Packet Radio Revolution" and "promising at least to be the biggest innovation in our hobby since two-metre repeaters," the IARC executive has designated 144.675 as the packet frequency. Two packet repeaters are in the planning stage, in Haifa and in Shoresh. . . Due to constant interference from clandestine transmissions from north of the border, R3, the Haifa FM 2-meter repeater may be accessed only by stations having their signals accompanied by a 192.8-Hz subaudible tone. A Haifa amateur has come out "with a brilliant innovation: a private-line generator using the Mostek **MK5087N** touchtone IC, a 455-kHz miniature resonator, 5 capacitors and 3 resistors. Cheap and easy to construct, the device can be installed in any radio." A similar PL may be installed on R1, the Jerusalem repeater, thereby silencing the occasional intermod and other undesirable signals (*from* Israel Ham News, *4Z4MK, Editor*).

People's Republic of China. Last month in this column, a prediction was noted that China would become the world's largest market for TV a few years from now, with enormous implications for all of the world's different cultures. The question was asked: What will hams, whose communications pass across cultural boundaries effortlessly, be doing to foster understandings and decrease misunderstandings between them? *73 Amateur Radio* hopes to do its part: We are responding to a letter from Chang-Han Dong (see Letters) by (of course) sending him the information he requests, but also we are inviting him to become a contributor to this column.



BRAZIL

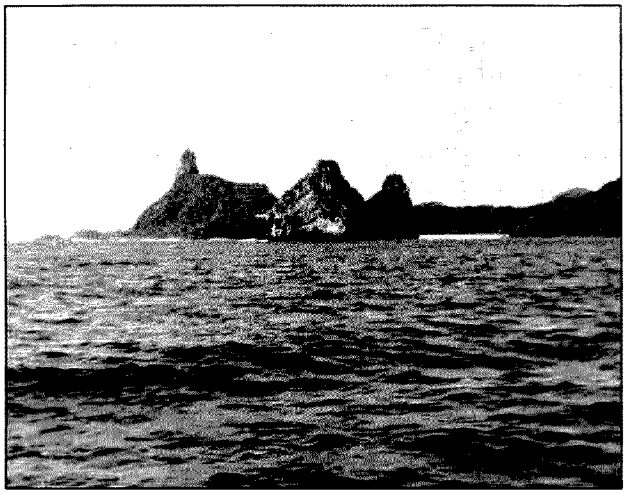
Carlos Vianne Carneiro PY1CC
Rua Afonso Pena 49, Apt. 701
20270 Rio de Janeiro, RJ
Brazil

ILHA FERNANDO DE NORONHA

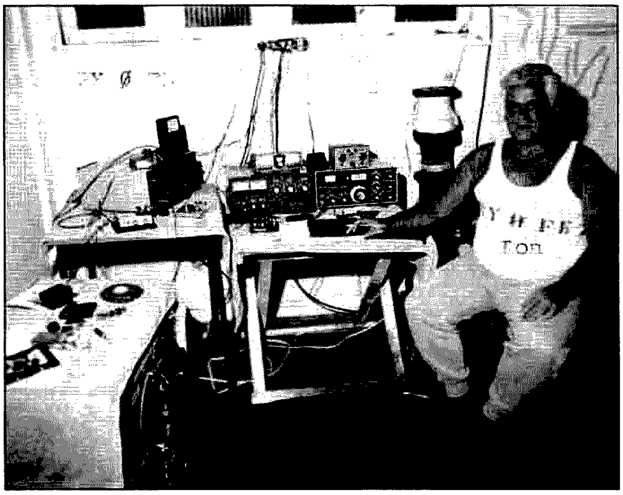
At about 32 degrees West Longitude and less than 5 degrees south of the equator, some 345 miles off the coast of Brazil, is the Fernando de Noronha Island group. It is home for the Brazilian PYØ–A and B class operators.

Ilha Grande, about 10 km long and 3.5 km wide, with a permanent population of 1,350, is the largest island. Like all of them, it depends entirely on Federal Government help since there is no way it can maintain itself. Food, goods, fuel, and sometimes even water are imported from continental sources. The Territory was created by Brazil during World War II for strategic purposes; every three years a governor is appointed by presidential decree—usually an officer of one of the armed forces.

A magic island for radio amateurs, this site for 24-hour propagation reaches out to all six continents on at least two or three bands daily, reaching you through



Fernando de Noronha, The Magic Island for 160-meter operation.

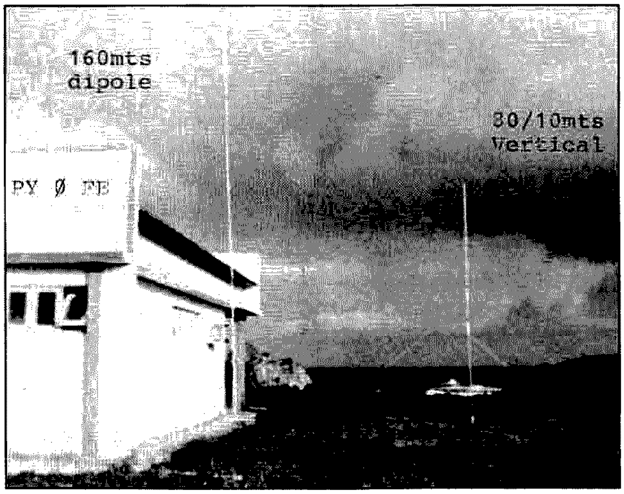


Ron PYØFE on Ilha Grande.

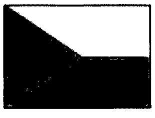
any antenna you raise, no matter how simple. We know we are coming to the end of a NO-propagation period, maybe next year [written in 1986], but at Fernando Noronha this phenomenon simply does not exist! A DXpedition to the islands means a sure hit, no matter date or time!

Ron PY1BVY, our enthusiast for DXpeditions, has just spent some two weeks at Fernando de Noronha as PYØFE and had a very successful CW operation in spite of the island's "shuttling" power from 190 to 205 volts, moving difficulties from one operating site to another, and the daily conflict between his radio amateur desire to keep operating during the lunch hour at best propagation times and hunger for lunch at the island's only hotel, 3.5 km away. Nevertheless, he made 4,008 OSOs with 89 countries on six continents. On his pet band, 160 meters, Ron made 620 QSOs during 11 nights, reaching 65 countries. There were 163 Russian stations reached, 73 in Czechoslovakia, and 238 in the States.

Very special QSLs were printed, and pretty soon all QSOs will be answered. Ron thanks Air Force Brigadier Milton Pauletto (now in command at Fernando de Noronha) and EMFA (Armed Forces HQ) for the extraordinary facilities provided him, and LABRE RJ, Radio Amateurs League, for contacting DENTEL authorities and allowing the use of the former PYØFE call used in the 1983 DXpedition to these islands. Ron's next goal is St. Peter/St. Paul Rocks, and knowing him as we do, well, it's just a matter of time....



Antennas on Fernando de Noronha.



CZECHOSLOVAKIA

Rudolf Karaba (OK3KFO ARC)
Gogol'ova 1882
955 01 Topol'cany
Czechoslovakia

AMATEUR ORGANIZATION

All radio amateurs in Czechoslovakia, Including SWLs, are united in the organization called SVAZARM, which provides free all necessary services: QSL service, diploma agency, manufacturing of and the provision of receiving and transmitting equipment, publishing and distributing handbooks for training in every branch of our hobby.

There are several thousands of amateur radio shortwave listeners in the nation, especially among the youth. Most amateurs have passed the examinations and operate through the some 500 club stations. One is eligible for a license at age 10; youths get experience with the help of the older operators, and qualify for a license after making 500 contacts in a club station.

There are two kinds of licenses, one for VHF operation (no Morse code required) and one for HF and VHF, which requires passing a Morse code exam. Every licensed operator is allowed to operate CW only, at first, on 1.8, 3.5, and 28 MHz, with the output power up to 19 W on 1.8 and up to 25 W on the others, and all legal modes of operation on VHF bands from 145 MHz up.

Young people 15 to 19 who have properly qualified can obtain special permission to work club stations. Their calls will be issued with the prefixes OL1–OLØ depending on geographic location; suffixes will always be three-letter ones. At age 18, one may apply for a personal license for HF and VHF bands, class C or class D. The first permits 10 W on the 160-meter band, 25 W for 3.520–3.600 MHz and 28.100–28.200 (CW only), and 145 MHz and up (all legal modes). The second is for 25 W on VHF bands only.

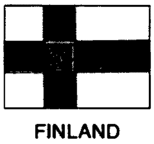
It is possible to pass through further exams for class B after a year in class C. Then 100 W output on all amateur bands, all modes (except 160, which is 10 W for everybody). After three more years, a class A license may be applied for, permitting 300 W output. A special 1-kW permit may be requested by class A operators for use in contests or for technical experimentation.

Class A, B, C, and D licenses will have callsign OK1, OK2, or OK3, depending upon QTH, with two- or three-letter suffixes. OK4 denotes operation from a ship; OK5, 6, 7, and 9 are special-event stations; OK8 is the prefix for foreigners licensed in Czechoslovakia; and OKØ is for VHF repeaters.

Licenses are for five years; they are free, as are extensions. There are no reciprocal agreements, but anyone may make an individual request for a license. There are some 2,200 licensed operators in the country.

The Central Radio Club of Czechoslovakia offers a variety of diplomas for radio amateurs worldwide; every second weekend in November is the OK–DX Contest, open worldwide. I'll write more about them later.

Thanks to Jiri Pecek OK2QX, publisher/manager of CRC, *Riedlova 12, 750 02 Prerov, Czechoslovakia, and Josef Stolcar OK2YN for the above information.*



FINLAND

Jukka Kovanen OH3GZ
Varuskunta Rak 47 As 11
SF-11310 Riihimaki 31
Finland

Please note a new address for the Finnish QSL Bureau: Box 30, SF-00381 Helsinki, Finland. The old address, Box 1, 00751 *is closed*.

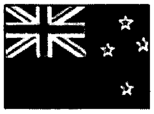
SANTA CLAUS AWARD

The Worked Santa Claus Land Award is now available for qualifying contacts made after January 1, 1986—20 points required for Europe/OH stations, 15 for Europe, and 10 for stations elsewhere. Contact with OH9SCL (situated at the Arctic Circle in Finnish Lapland) is worth 5 points (10 points in December); contacts with OH9, OF9, OG9, and OI9 stations are one point each (3 each in December). There are about 150 OH9 stations.

No band or mode limits; same station can be counted only once; one SWL report per station counts as one contact.

Award stickers also available for each repeat of the same number of contacts required for the basic award.

Report the date and UTC for each contact, callsign, RST, frequency, and mode. Send with $6 or 10 IRCs (for postage and handling) to OH9AB/Award, PO Box 50, 96101 Rovaniemi, Finland; for stickers, only a self-addressed envelope is required along with your report. *Remember to give us your address when writing to us!!*



NEW ZEALAND

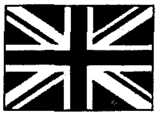
D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

The 1987 ZL Field Day dates will be Saturday, March 14, between 0300 UTC and 1200 UTC, and Sunday, March 15, between 1800 UTC and 0300 UTC, operating on 40 and 80 meters, phone, and CW. Field Day stations may be worked once on each mode in each hour of the operating periods. ZL FD stations listen out on CW for overseas contacts when propagation is suitable.

The changes to the New Zealand Amateur Operator certificate structure will *NOT* have any effect on the reciprocal licensing arrangements in operation at present. The appropriate license will be issued to the visiting amateur according to the qualifications of his/her current license

when it is submitted with an application. If you have any questions about all this, please get in touch with Russ Garlick ZL3AAA, 23 Lydia Street, Greymouth, New Zealand, or with me. But please remember: You must allow yourself sufficient time to obtain the application forms and to get answers to your questions so that your completed application, in duplicate, and the photocopies of the necessary documents reach New Zealand in plenty of time to be processed before you arrive—say three to four weeks before you get here.

73 International reminds you to send IRCs with any of your queries to overseas destinations to cover postage for the requested responses.



HONG KONG

Philip J. Weaver VS6CT
PO Box 12727
Hong Kong

First of all, may I take this opportunity to wish all *73* readers a very Happy and Prosperous New Year from everyone in Hong Kong!

In December, after my five-month around-the-world trip, I decided to stay on in Hong Kong regardless of the 1997 issue. [The Crown Colony 99-year lease ends then, and China has indicated its intention to regain sovereignty over Hong Kong at that time.] I've lived here 13 years now, and this is the place for me. I'm negotiating to buy the top floor of a 20-story apartment building, with a shack already on the roof; I have a Japanese-made aluminium tower (hand-carried from Tokyo!), and hope to be in residence by the time you read this, and on the air by Easter. I will concentrate on 10 through 20 and leave the low bands to Paul VS6DO, who has just acquired a rig with which he hopes to get DXCC on six; he has it on 160 already.

The Annual General Meeting of HARTS in December resulted in my being back again as president. HARTS monthly general meetings will be on second Tuesdays, 1930 hours, in the Volunteer Officers Mess, second floor of Beaconsfield House (next door to the Hilton Hotel in central HK). All visitors are welcome. . . which reminds me to recap on the licensing of hams in Hong Kong.

We follow the United Kingdom system, basically, with class A and B licenses. Reciprocal licenses can be issued to those showing they will be resident for over 90 days; all you need to do is provide a copy of your license and passport (for the records) and HK $130. A license can usually be issued in under an hour. A Hong Kong address is required for under-90-day visitors, who will get a reciprocal license based on their home call/VS6. The rules pertaining to country and kind of license are those of the U.K.

HARTS had an expansion year in 1986, with the new B class members and, of course, with new overseas personnel coming in all the time. We welcomed back VS6EY and BL, who keep those interested in CW very happy! Membership stands at 271 from among the 427 who are licensed (157 class A, 233 class B, 29 visitors, and 8 club stations). The High Interest Tech group members are experimenting with simplex voice digitizing using a Japanese kit, STR68PLV2, with a Toshiba T6668 voice processor. The two-meter repeater expansion has slowed some, and we still have only two on the air, on 145.650 and 145.750, both −600 input. Visitors are more than welcome to use them; call me at 5-419452 to get access information and latest news on the three additional repeaters we have planned.

The local ICOM dealership has no agent at the moment, but call 3-7393360 with your enquiries—this is the number of a new company, Waysun Communications. The Kenwood dealership is due to be lost by Pacifica Products this month [March], but the main dealer, Kenwood Lee & Co., is still available. Cecil Lee VS6XPZ and Raymond Leung VS6UF are there, at 5-251204, to serve you. For Yaesu we have Samson & Co., where K. T. Chan VS6XRJ can be found, telephone 5-776599, to help you.

We have been experimenting with packet radio for some time now, and have heard that we are legal to operate from Hong Kong on the 2-meter and the 70-cm bands and soon on the HF bands. With no distributor here for any of the new TNCs, the most common solution has been to go to America for the AEA PK-232—which we find is made right here in Hong Kong. . . but we can't buy it here, at a discount. . . We've had negative responses to our suggestions. . . Any comments, AEA, if you see this. . . ?

If you happen to be tuning across 10 meters and hear some dreadful AM signals, it most likely is eminating from somewhere in Asia. It has been a chronic problem here and bitter complaining has had little effect since most of the transmissions appear to be coming from taxis. Roadblocks occasionally catch some, but that's only the tip of the iceberg. Part of the problem is the easy availability of CB equipment, which can operate above 28 and even into 29 MHz with only minor modification.

Talking about ten meters, let me remind you that we do have a beacon on 28.290 (VS6TEN) and another on 50.075 (VS6SIX). During 1986 I maintained contact with A4XIZ on 28.595, who normally monitors that frequency from 05–1130Z each day when his work permits.

I'll give you a further report from Hong Kong when my new address is established and I'll be in a position to offer any visiting ham the chance to operate from here—even, perhaps, doing some contesting, although I'm not sure yet what I'll be able to put up for the low bands as far as antennas are concerned. 73 from Hong Kong! ■

ATV

Number 14 on your Feedback card

Mike Stone WBØOCD
PO Box H
Lowden IA 52255

NEW REPEATER

The Chicago area has a new ATV repeater under construction! The remote transmitter portion of it went on the air in December. The project is sponsored by The Peacock Amateur Radio Club, which is made up largely of broadcast engineer types at many of the area TV and radio stations. Henry B. Ruh KB9FO heads up the project.

Touchtone™ control of the remote transmitter (mode A) is being done on 144.31 MHz. The actual repeater (mode B) will have sync recognition access on UHF. Input to the KB9FO ATV/R is on 439.25 MHz and output is registered with the USATVS and the Illinois Repeater Council at 421.25 MHz. A weather radar feed has been transmitted for long periods of time to "burn in" transmitter equipment, to test the antennas, and to check propagation.

The new system has been seen as far away as Lafayette, Indiana, at P3–P4 levels. Local area users are seeing P3–P5 pictures, with most reporting color. We welcome Chicago's new experimental system. As with any new idea, it has met with resistance from a few of the established old-timers. When they realize the possibilities of this machine going up on the Hancock Building or the Sears Tower, criticism will disappear quickly. It's time the "Windy City" had an FSTV repeater.

The new repeater is horizontally polarized using Big Wheel antennas—no one will have to uproot and change polarization. Many people tried FSTV in the Chicago area and were either run off by the older establishment or gave up due to lack of fun activity. It's time to blow the dust off those rigs and give Henry a call on 144.340.

Giving Thanks

We had a major UHF opening here in the Midwest all the way out to the East Coast last Thanksgiving. Not only were the 432 SSB fellas having fun, but the ATV picture gang was in there as well. Bill Brown WB8ELK of Findlay, Ohio sent me some TRS-80C "digitized" off-screen, computer-reduced pictures of contacts made over Thanksgiving. He can fit 20 pictures on an 8-1/2 x 11 sheet of paper. Fig. 1 contains examples of his work.

590-Mile DX Record

A new all-time FSTV DX record was set during this period between Paul KØIWA in Burlington, Iowa, and Ed W3POS in Erie, Pennsylvania. This "live TV contact" covered 590 miles. Ed has been looking west for that kind of DX for many years. More Iowa ATVers could have worked Ed, but the phone call that got Ed on 144.340 came late in the morning, when everyone else had gone off to work or to be with the family.

The USATVS is compiling a registry of the best ATV DX contacts. Please write to me and tell me about your best long-distance television contacts. Send dates, times, callsigns, distances, signal reports, etc. Your entry will be placed and published. No fish stories allowed!

Dave WBØZJP in St. Louis rolled into Iowa (over 200 miles) P5 and in color for a neat Christmas present. KA9TGX, K9WZB, WB8URI, and others have been real strong in the late evening and early morning hours. Jeff KA9TGX of Lafayette, Indiana, and I stayed up from 11 p.m. until nearly 4 a.m. one night and watched the UHF band increase in intensity (and our two-way pictures along with it). At 3:30 a.m. we toasted the perfect color, snow-free, P5 pictures with a cold one.

I have attended several VHF/UHF SSB DX conferences, lectures, and hamfest talks over the years, and the speakers all seem to take great pride in their long-distance work. Let me tell you, there is no greater challenge than to use the same temperamental UHF band segment and get a wideband TV signal through all the QRM to the fella's TV set on the other end.

CoCo Updates

As a late follow-up to our previous VCR ATV use discussion, Hap Griffin WA4UMU (Griffin Enterprises, PO Box 6104, Sumter, South Carolina) sent me his latest version of Video Titler, a graphics program for the Radio Shack TRS-80C Color Computer. This neat program costs only $11.50 ppd. It features Colorbars, a great Hollywood style director's clapboard, and a large 5–4–3–2 number sequence that goes to black. You can enter information on the clapboard such as ATV-DX segments, home movie titles, etc. It is designed to be used in conjunction with your VCR for titling programs. If you have a VCR, a CoCo, and are on ATV, this program is highly recommended.

Facsimile

While we are talking about the CoCo, the latest version of COCO-RADIO is 5.0. Facsimile transmit has been added, along with all the other ATV, RTTY, SSTV, TVRO, OSCAR, Morse, CW, and other programs included in the three-disk package. For the latest information sheet, send me an SASE. This unique FAX transmit breakthrough can be sent at 120 or 180 lpm. 180 lpm means capability with a lot of older Western Union hard-copy machines. Martin Goodman's receive program in *Rainbow* magazine got a lot of amateurs interested in facsimile communications. WB8TPD's programs in *73* for the Atari ("One-Chip Facsimile," December, 1985) and the C-64 ("Just The FAX, Ma'am," October, 1986) brought similar interest. Fred Sharp W8ASF in Cleveland, Ohio, has built up a YU2 interface for quality high resolution. See Ralph Taggart's WEATHERSAT column for more information.

Check out the weekend HF FAX activity on 14.240–14.245 MHz. Several Japanese stations have been monitored (and printed) and are desperate for two-way U.S. contacts. Now that the FCC has given us permission to make use of the mode on HF frequencies, how come we haven't been doing it? There should be an increase now in the number of operators that can send as well as receive FAX pictures using the CoCo. C-64, IBM, Apple, and Atari owners have similar receive-only programs going. Let's all get together on Saturday and Sunday mornings at 10 a.m. Central Time at 14.240 MHz USB. Our first official meeting schedule will be held on March 14. Mark it on your calendar. I'd like to hear from some of you who are working the FAX Ham-TV mode. Send me some of your pictures.

Are you looking for a good, reasonably small HF shortwave antenna to pick up FAX pictures on? I recently installed an Alpha Delta model DX-SWL multiband sloper that works real well on the designed frequencies—13, 16, 19, 21, 25, 31, 41, 49, 60, 90, and 120 meters and the mediumwave band (0.5–1.6 MHz). It has even improved the signal strength level of frequencies like 8.080 MHz and NAM FAX signals. It costs $69.95 (plus shipping) and is obtainable from Universal Amateur Radio, 1280 Aida Drive, Reynoldsburg OH 43068; (614)-866-4267.

Dayton Preview

This year's Ham-TV get-togethers at the Dayton Hamvention are taking shape. The annual Don Miller W9NTP/Robert Suding WØLMD SSTV sessions should be conducted again at the Holiday

Fig. 1. Digitized computer-reduced pictures produced by WB8ELK on his CoCo. On top: W3POS and KØIWA, ATV DX record holders. On the bottom: WB8ELK hams it up during Thanksgiving week 1986.

Inn North beginning at 7 p.m. on Saturday evening. I'll give you all the details if Don gets them to us in time for the April issue—otherwise tune into the 14.230-MHz SSTV net as Dayton draws near. Don always assembles a good lineup.

We will be hosting our second FSTVer's Workshop this year at the Traveler's Motel North in Dayton (the old La Quinta North) where we met before. A large suite has been reserved to accommodate 50–70 people. There will be a $1 donation as you enter to help pay for the room and refreshments. This year we will offer an expanded session starting on Saturday afternoon at 2 p.m., with an informal open period for you to come in and rest your tired feet.

We'll show VCR tapes, align filters, and talk about what's going on in your part of the country on ATV. The Saturday night program begins at 7 p.m. A number of speakers have committed: John Beanland G3BVU/W1 of Spectrum International will give a technical talk on the importance of interdigital bandpass filtering for ATVers. Bring your portable VCRs and Camcorders.

The Traveler's North is known as the ATV hangout, so you might want to make reservations. A couple years ago we all set up FSTV stations and worked motel to motel simplex through the Dayton (vertical) Repeater. Talk frequency will be 147.570 (Dayton Repeater voice channel input) or 144.340 simplex.

> ***"Please write to me and tell me about your best long-distance ATV contacts. No fish stories allowed."***

The Dayton ATV/R

Here are some specifics about the Dayton ATV Repeater sent to us by Bill Parker W8DMR of Columbus, Ohio: It is located ten miles south of Dayton. Output is 20 Watts average on 426.250 MHz, with FM audio at 430.750 MHz. Input is on 439.250 MHz. I'm not sure if vertical or horizontal polarization is used. The repeater has 45-mile coverage. A two-meter FM voice input at 147.450 MHz brings the repeater ID up for 20 seconds. Dropping the two-meter carrier "reverses" the video ID. A second video and audio input at 1245.0 MHz exists. The 1245.0-MHz input is two-meter touchtone (TT) controlled. TT 0 turns the receiver on. TT # latches the ID on for three minutes. TT * resets the system. TT 5 brings up a weather radar video. TT 6 turns on the repeater. The DARA ATV Repeater is sponsored by the Dayton Amateur Radio Association and is maintained by Bruce WB8UGV in Centerville. DARA plans to increase the power to 200 Watts sometime this year.

At the Press

The new Spec-Com *North American ATV Directory* is at the press. It features an up-to-date USATVS membership listing, a guide to U.S./Canada/Mexico ATV repeaters, clubs and activity groups, 2-meter talk maps, DX honor rolls, ATV advertising, and a lot of other good information. If you'd like a copy, send $8.95 to the Spec-Com Communications Group, PO Box H, Lowden IA 52255. Mark 73 on the outside of your envelope. First mailings will be conducted right after Dayton.

A final reminder to keep filling out those Feedback cards and mailing them back to Wayne. It is your interest that keeps this column going. Send me some photos, gang. Until next month, see you "on the tube."■

RTTY LOOP

Number 26 on your Feedback card

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

UTU USES

March winds have blown in a whole raft of information this month, and wouldn't you know that most of it is RTTY-related? Well, here we go!

Thanks to Travis Brann, the Technical Services Manager at Kantronics, we have some more information on interfacing various home computers with RTTY stations. Of course their terminals, including some with built-in "smarts," are designed to interface with any computer capable of communicating with a modem, which runs the spectrum from a VIC-20 to an IBM PC.

Now, while this information is based on the Kantronics Universal Terminal Unit (UTU), I don't see why it could not be applied by the able ham to other hardware schemes. Nevertheless, I will use the UTU connector as the "standard" for this information, and pass along my sincere thanks to Travis for the information.

Fig. 1 shows the hookup needed for the Apple //c to interface with the UTU. With a standard Apple Term program, and the UTU connected but turned off, choose option "C" to change configurations and select the following parameters: half duplex, pulse dial, 300 baud, no parity, one stop bit, eight data bits, 30-second delay, and no line feed. Then enter the terminal mode, power on the UTU, and press RETURN>. When the UTU menu appears, turn off the echo and proceed as the manual directs.

PCjr users can use the UTU as well, with the UTU-TERM program designed for the IBM PC. Hardware interfacing can be accomplished two ways: by a PCjr adapter cable (a nine-wire cable that connects to the 16-pin connector on the PCjr and terminates in a standard DB-25 connector) or by wiring the UTU cable directly to the 16-pin connector. If you use the adapter, wire transmitted data (white) to pin 2, received data (brown) to pin 3, and ground (black) to pin 7; jump pin 4 to pin 5, and pin 6 to pin 20. If you are wiring directly to the PCjr connector, A4 is transmitted data, A8 is received data, and B2 is ground. Then, when you run the UTU, run UTU-TERM and follow the menus.

This same DB-25 hookup, using the three active pins (2, 3, and 7), will also work to interface a Xerox 820-II computer. For that matter, essentially any computer that supports standard RS-232-based interfacing should connect the same way.

VIC-20 or C-64 users, here's the dope for you. Fig. 2 is the hookup to the UTU connector to the user port of your computer. Fig. 3 is a short Basic terminal program. When you're using this program, the "#" key functions as an escape key, and the "@" key returns the system to receive when placed at the end of text while you are transmitting. Load this program from tape or disk, run it, then turn on the UTU. Press RETURN> and the UTU menu will appear.

Color Computer users, your hardware hookup to the serial port is shown in Fig. 4. There are a variety of terminal programs you may use to run with this one. I might mention MickeyTerm, a versatile ASCII terminal program available for downloading on both CompuServe and Delphi, in the Color Computer sections. Other programs, even cartridge-based ones, should work as well.

Tandy 1000 users, use the three-wire hookup described above, and enter DeskMate, which probably came with your computer. Select Telcom and set parameters as no autodial, 110 or 300 baud as desired, eight bit, no parity, one stop, X-on/X-off on, and all others off. Hit F5> for terminal mode; then turn on the UTU and hit ENTER>.

TRS-80 Model 100 folks, use the same three-wire hookup. Then enter TELCOM and type 38N1E,10 to set up your options. You should know the rest by now.

I do want to emphasize that, while I have been using the UTU as an example here, any "smart" interface should do fine. Additionally, other forms of interfacing may well suggest themselves from this data. My purpose here is to show ways to get data into and out of many personal computers for use on RTTY. Thanks to Travis Brann for helping to make this possible.

Now let's see, who are we leaving out? Dr. Siegfried Sprainys DJ4SS in West Germany is looking for information on Atari RTTY. He is the owner of two Atari 800XL computers and wonders, among other things, whether or not the Kantronics UTU will work with the Atari. I don't see why not. Assuming you have serial interfacing on the Atari, any terminal program should work just fine with a "smart" interface, such as the UTU described above. As I have said before, I can only publish what I find out about. So, if there is a lack of coverage in certain areas, it is only because individuals have not stepped forward with the information. Well, folks?

ZX-81/TS-1000 Add-Ons

Timex-Sinclair computer users

```
                          Transmit Data (White)
                       +--------------------------------+
                       |                                |
x----o     o----x      |               +----------o     o
  +--o     o-----------+               |     x----o     o----x
  |     o                              |             o
  |     |  Ground (Blk/Shield)         |             |
  |     +------------------------------(-------------+
  |   Receive Data (Brown)             |
  +------------------------------------+
    Apple IIc
    Modem Port                                     UTU

               pin configuration 3 1
                                 5 4
                                  2
```

Fig. 1. Apple //c hookup.

```
                                    Transmit Data (White)
000000000000                       +--------------------+
000000000000                       |                    |
||       ||  Receive Data (Brown)  |   +----------o     o
||       ++------------------------(---+
|+---------------------------------+         x----o     o----x
|                                                    o
|          Ground (Blk/Shield)                       |
+----------------------------------------------------+
NM-------CB-

VIC-2Ø or C-64
   User Port                                       UTU

                                pin configuration  3 1
                                                   5 4
                                                    2
```

Fig. 2. VIC-20 or C-64 hookup.

get a boost from Bob Howard WA6DLI of West Covina, California. He tells us that he was anxious to mention that in the September issue of *73*'s RTTY Loop, the answer to VE2AGY's question about the TS-1000 was right there, under the ZX-81 banner.

"You see, Timex manufactured the ZX-81 for Sinclair and when they decided to market it in the U.S. under the Timex label as a TS-1000, they only added 1K to the memory to make it 2K RAM plus the 8K ROM. When either the ZX-81 or the TS-1000 is expanded to 16K, it is the same as the other machine in all respects. The TS-1500 is an improved TS-1000 with movable keys and a built-in 16K memory. The TS-2068 from Timex is the Sinclair Spectrum of England with improvements. With a Spectrum ROM in the cartridge dock or switched internally, a TS-2068 runs the 6000 Spectrum programs.

"The English ham programs include the G1FTU no-interface RTTY program that just connects to your transceiver speaker and mike plugs and feeds the computer mike and ear jacks for the cassette recorder (program save feature). This really works and the program is excellent in features. G1FTU has CW and SSTV programs also. The SSTV is receive only, of course. These may be purchased from a Swedish ham: SM3HBQ d/b/a Chara Electronics, PO Box 119, S-813 00 Hofors, Sweden. The Sinclair net on the air and the newsletter for U.S. hams (from K5XY in Las Cruces, New Mexico) are called QZX. The West Coast net is Saturdays on 7.235 MHz at 10 a.m. Pacific Time. The East Coast QZX net is on Sundays at 1600 UTC on 7.245 MHz. The 20-meter net is 9 p.m. Eastern Time on 14.345 MHz.

"Adding an external keyboard to the ZX-81/TS-1000 makes it an excellent ham computer. It will have better logic than more expensive computers and can be found in garage sales for $10–35, often with memory packs and a TV thrown in. I use the ZX-81 on CW, and with a screen to read the code, I find I have never bothered to tune RTTY [Thanks. . . mil] as the effect is about the same but more contacts are available in the CW bands. The NU4V CW software and interface copies signals weaker than my Kantronics Mini-Reader."

My thanks to Bob for this wealth of information on what may well class as one of the genuine bargains of the computer RTTY crowd. Ten bucks? Even I might spring for one at that price!

"If there is a lack of coverage in certain areas, it is only because individuals have not stepped forward with the information. Well, folks?"

Packet for the Apple?

On the E-mail wire this month, we find a message from Lee Cook of San Antonio, Texas. He says that he has been reading RTTY Loop for years and now has a question. He has been using an Apple II since 1977 on RTTY on ham and USAF MARS HF and VHF.

"Of course, at first I tied the Apple to a Model 15, then a Model 28, and now for the past five to six years I've been using an Epson MX-80 for the printer. It has always worked quite well. Originally in 1977 I was stationed with Dr. Galfo at Langley, Virgina, and, of course, the first RTTY program used was his, using my own hardware built directly into the Apple II. Since then I have built up about 50 or so Apple II, II+'s, and recently two //e's for MARS members. In 1981 I switched to the Super-RATT program, which started out at first as an AF MARS program and was later sold as a ham program also. Most recently I have added a C-64 with a PK-64 for packet and AMTOR paralleled with the Apple II and can run immediate transfer between VHF and HF, HF and HF, and HF to VHF with the two systems tied together. I have also updated Galfo's original program with my own version with files, etc. As you can see, I have been at RTTY with the Apple for a long time. My problem and question to you is this: Has there yet been any good packet program written for the Apple comparable with the PK-64?

"The Apple has been with me as DL5LC in Germany, HZ1ZZ in Saudi Arabia, FØATS in France, G5AVK in England, and ON8VV in Belgium. Since I now also have a II+ and //e, I would like to expand the Apple use into packet, but so far to no avail. One last thought: So far, all the RATT, CW, SSTV, and AMTOR programs for the Apple use the game port (Galfo, Super-RATT, and my own program), although the Egbert program uses the cassette ports.

"I feel packet is way too fast for the game ports to use, so I think it should use RS-232 interfacing. This is the problem with no known, to me, programs that use RS-232."

Well, Lee, I don't have any easy answers for you regarding interfacing other than via the game port. I took a survey of what I have noted and you appear to be right, zippo! Perhaps one of our faithful readers will drop us a line, and if so, I will pass the information along to you. One other note, if you can, why not share the modified program you wrote with us, here? I am sure that Apple users would appreciate the information.

Teletypes Are Junk

Another E-mailer is Dick W7EIO from Santa Ana, California. He writes: "I am a Western Union technician with years of Teletype® experience with 32s, 33s, 28s, 35s, and 15s. The selector magnets on 32s and 33s aren't 20 mA, but about half an amp through a magnet driver card, fed by about 35 volts. The card in a 32 also has motor control circuitry on it which can confuse a non-technician ham. Model 33s used as TWXs can be used on any computer network by phone as is, and the set can be used with RS-232, but the supply is ±20 volts, too much for most RS-232s.

"Teletypes need oiling and contact cleaning at least yearly or they will garble. When garble has set in, permanent damage has already started. The best oil is Air Conditioner Oil sold at Sears Repair Centers in a plastic squeeze bottle. Teletype machines are a specialized science and require knowledgeable technicians and clean signals free of bias and distortion, beyond most ham's capability. Parts for 32s and 33s are no longer available, so Western Union no longer overhauls or heavily maintains them, but junks them by the ton. These machines are worn out and unrepairable, and are no bargain.

"I also take exception to your 45-baud Baudot to 110-baud ASCII converter idea. Western Union has the Telex at 45-baud Baudot and TWX (Telex 2) at 110-baud ASCII, and now has a translation computer, but it restrains the 110 machine while the buffer and 45-baud terminal catch up. ASCII has many characters not available on Baudot, so the computer puts '/' on the Baudot machine in their place. It is a one-way street.

"For these reasons, I suggest you use discretion when talking

about old Teletypes. I wore out two 33s on CompuServe, and tossed them both when worn out. I am willing to help non-technician hams. I'm at 1413 N. Spurgeon Street, Apt. 8, Santa Ana CA 92701. SASE, please."

Well, Dick, 20 mA is the *loop* current, if not the magnet current proper. The driver card in the 33 and related series makes the internal operation transparent to the user. While I agree with you regarding service, I remember how happy I was when I acquired a tub of lithium grease through a local MARS group a few years back when I was active in that organization. The difference is time vs. money. It certainly is not cost effective for commercial communications enterprises to spend more than a machine is worth, in parts or people time, to repair a defective machine. However, amateur RTTY got its start with just such machines. I have fixed Model 15s with parts as strange as rubber bands from orthodontic braces or ballpoint pen springs. I couldn't begin to count how many hours I put into my Model 33 when I first got it—as a nonfunctioning junker. And nonfunctioning it was!

```
10 OPEN2,2,3,CHR$(6)
20 GET#2,A$
30 GET B$
40 IFB$="L"THEN B$=CHR$(27)
50 IFB$="@"THEN B$=CHR$(5)
60 IFB$<>""THEN PRINT#2,B$;
70 GET#2,C$
80 IFC$=CHR$(5)THEN30
90 PRINTC$;:GOTO30
```

Fig. 3. VIC-20 or C-64 program. The L in line 40 (IFB$ = "L") should be a British Pound Sterling sign, but that is not an ASCII character.

```
                         Transmit Data (White)
+-----------------------------------------------------------+
|                                                           |
+--O     O----x                       +-----------O         O
             Receive Data (Brown)     |
+---O   O-----------------------------+      x----O         O----x
|                                                       O
|        Ground (Blk/Shield)                            |
+-------------------------------------------------------+

   CoCo
Serial Port                                             UTU

   4  1                 pin configuration               3 1
    3 2                                                 5 4
                                                         2
```

Fig. 4. CoCo hookup.

The point is that rolling up your sleeves and making a machine labeled GFPO (that's "good for parts only") come up on the air is one of those things that makes ham radio what it is!

Now, as to ASCII-to-Baudot conversion, receiving ASCII sent by hand is no problem on a Baudot machine. Few folks can type at 60 words per minute, although I admit that receiving machine-sent code requires an intermediate buffer. The character set is not really a problem, either. I wrote a simple 6800 program years back that translated ASCII characters into four character groups in Baudot. The printer can zip along, and the full character set can be represented. And, as we have shown in the column over the last ten years or so, it is being done with a multitude of computer systems.

Thanks for the offer of help, and I look forward to hearing from you again, soon.

And...

Assorted RTTY greetings to John C. Vanderbeck KM7O of Seattle, Washington, and Gerald Meltzer, M.D., of Denver, Colorado. Your interest in the column is appreciated, as always, and I have sent you materials as requested. Hope it is of use.

John E. Wesson WB5AKZ of Lake Village, Arizona, has a HAL ST-6 demodulator and wonders if there is some way to use this terminal unit with a computer. Sure there is. The FSK output from the ST-6 is demodulated RTTY at RS-232-compatible levels. Just hook this where you would hook any RS-232 input and you should be all set. There, now wasn't that simple? They should all be that easy!

Enough for this month. I think we have set a record in the number of systems, machines, and computers mentioned. Don't forget that you can still reach me on CompuServe (75036,2501) or Delphi (MARCWA3AJR) or USPS at the above address. And don't forget that all-important SASE with postal requests. Above all, don't be a "fool" and miss April's RTTY Loop!■

PROPAGATION

Number 23 on your Feedback card

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40			20	15	15	15	15	
SOUTH AFRICA									15	15	15	
U.S.S.R.							20	20				
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20	20						15				
ARGENTINA										15	15	15
AUSTRALIA	15	20				40	20	20				15
CANAL ZONE	20	20	40	40	40	40			15	15	15	20
ENGLAND		40	40					20	20	20	20	
HAWAII	15	20	20	20	40	40	40					15
INDIA								20	20			
JAPAN								20	20			
MEXICO	20	20	40	40	40	40			15	15	15	20
PHILIPPINES								20	20			
PUERTO RICO	20	20	40	40	40	40			15	15	15	20
SOUTH AFRICA										15	15	20
U.S.S.R.								20	20			

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20	20	20		40	40	40	40				15
ARGENTINA	15	20		40	40	40					15	15
AUSTRALIA		15	20	20			40	40				
CANAL ZONE			20	20	20	20	20	20				15
ENGLAND									20	20		
HAWAII	15	20	20	40	40	40	40					15
INDIA		20	20									
JAPAN	20	20	20			40	40	40			20	20
MEXICO			20	20	20	20	20					15
PHILIPPINES	15						40		20			
PUERTO RICO			20	20	20	20	20	20				15
SOUTH AFRICA										15	15	
U.S.S.R.									20			
EAST COAST		80	80	40	40	40	40	20	20	20		

Sunspot Cycle 22 will produce some new spot groups to benefit propagation. Normal springtime improvements will take place—exceptional worldwide contacts will be possible, even on 10 and 15 meters. Things are beginning to look up for DXers. On many days, however, the geomagnetic field will be unsettled to active, making propagation spotty at best.

MARCH

SUN	MON	TUE	WED	THU	FRI	SAT
1 F-G	2 G	3 G-F	4 F-P	5 P	6 P	7 P
8 P-F	9 F	10 F-G	11 G	12 G-F	13 F-P	14 P
15 P	16 P	17 P	18 P	19 P	20 P-F	21 F-G
22 G	23 G-F	24 F-P	25 P	26 P	27 P-F	28 F
29 F-P	30 P	31 P				

APRIL 1987
Issue #319

73 Amateur Radio

USA $2.95
CAN $3.95
A WGE Publication

SPECIAL ANTENNA ISSUE

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NEVER SAY DIE

BEWARE!

Readers have been concerned over a rather clever new business (scam?). Letters have been going out to hams who haven't renewed their tickets offering to renew them for a measly $35.

The letters are from Federal Licensing, J.V., Amateur Radio Service Division—and Lordy, they're from Gettysburg—with an alternate address in McLean, Virginia, the home of the CIA! Here's my $35, fellas.

Of course, the alternative is to be a cheapskate and spend 22¢ to do the same thing, but without the professional help of FLJV/ARSD. Have you ever heard anyone even suggest that hams are cheapskates? Well . . . yes . . . come to think of it, I've heard that calumny a whole lot.

After I got through chuckling at the audacity of the approach, I remembered a lovely old scam. There was this clipping service that sent out letters to hams informing them that their name had recently appeared in a national radio publication. Now, for only $5 (or some such), this outfit would send you a copy of the clipping. Wow! They must have mentioned me in a ham magazine! $5 later you'd get a snip from the *Callbook* with your name and address. Now I call that creative sales! And a lot easier than going to some silly remote island and shaking down Honor Rollers for a hundred bucks a head for a new DXCC country.

Let's see, I wonder how much an "office" in Gettysburg would cost? All I'd need would be a simple mail drop—then I could open the Federal Communications Licensing Authority—charge a discount $25 for renewing licenses—and use the money to finance an episode on *Lifestyles of the Rich and Famous*.

There being no intelligence test given as part of the amateur radio exam, I'll bet I'd clean up. Say, I'll bet most CBers don't know there aren't any CB licenses any more . . . another even more promising vein to mine. I could start issuing operating permits from my Federal Communications Licensing Authority—complete with the sale of special callsigns. For $25 extra, I'd authorize the use of cartop flashing lights and an emergency communications decal for the car door.

Small business is the life blood of America—right? So let's be creative in thinking up new small businesses. Now, I wonder if I can get Federal Licensing, J.V. to advertise their marvelous service in *73*?

Metro Washington, D.C
P.O. Box 776
McLean, VA 22101

FEDERAL LICENSING, J.V.
AMATEUR RADIO SERVICE DIVISION

Gettysburg, PA
P.O. Box 610
Gettysburg, PA 17325

Dear Licensee,

Our review of FCC records has revealed that the radio station authorization - LICENSE - which you were granted within the AMATEUR RADIO SERVICE has EXPIRED. As you are aware, it is a violation of FCC Rules to operate a radio system without proper authorization.

If you wish to renew your license, we can assist you in the preparation and filing of the documentation required to obtain a current license. To facilitate this, simply follow exactly the steps below.

1. Review and correct if necessary the information contained on the address label below
2. Print the name and telephone number of the person to contact where indicated.
3. Attach completed form to your service and preparation fee payment of $35.00. Please make your check payable to Federal Licensing, J.V.
4. Mail all items noted in "3" using the envelope provided.

Expired licensees presently have a grace period of 2 years to renew and retain their call sign. If the license expires for a period of 5 years, the applicant is then required to re-test. All new amateur licenses are now granted for a period of 10 years.

Federal Licensing is the only licensing organization located adjacent to the FCC Amateur Branch in Gettysburg, PA. Additional assistance regarding your licensing needs is always available by calling us at (717) 334-9262 between 9:00 AM and 4:00 PM.

Sincerely,

John A. Hertrick
Federal Licensing

If you receive a letter like this from "Federal Licensing, J.V.," pitch it. You can save $34.78 by ignoring the letter and renewing your license yourself.

OUR 50-YEAR-OLD TRAFFIC SYSTEM

A message sent via the ARRL National Traffic System arrived this morning. It had to do with a coming visit from a Kansas ham. Well, that was nice—except the message was delivered three days short of a month after it was sent and the chap had visited a couple weeks ago.

How about it, you fanatic ARRL members, is constructive criticism uncalled for—out of line—blasphemy? Am I a candidate for the lunatic fringe if I even suggest that we're close to the 90s—and not the 1890s—that perhaps it's getting time to get the delivery time down to two weeks on messages? One would think that our advances in technology should somehow be usable to get traffic through within seconds anywhere

Continued on page 10

QRM

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Circulation Offices
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QRX . . .

EDITED BY PERRY DONHAM KW1O

Novice Enhancement Is Here!

AFTER NEARLY A YEAR of anticipation, the Federal Communications Commission has announced the approval of PR Docket 86-161, ushering in a system of new and exciting privileges for Novice operators. Effective March 21, 1987, at 0001 UTC, Novices will be able to use all amateur modes on three bands in the HF, VHF, and UHF ranges. (Note that, although we are talking specifically about Novices here, due to the structure of the present license system, Technician-class operators also gain the new privileges.)

On 10 meters, Novices can operate CW and digital modes from 28.1–28.3 MHz, and CW and SSB from 28.3–28.5 MHz. Novices and Technicians are limited to 200 Watts output in this subband; all other licenses may use the full legal limit.

On 1.25 meters, all modes may be used from 222.10–223.91 MHz, with a power output not greater than 25 Watts.

On 0.23 meters, the subband runs from 1270–1295 MHz, with a power restriction of 5 Watts.

In every case, Novice stations may not be set up as a repeater or auxiliary station, and a Novice cannot be the trustee of a repeater, even if the repeater's input and output frequencies fall within a Novice subband. I'm certain that this does not imply that digipeating is forbidden when using packet.

The commission specifically prohibits the use of AM by Novices in the new 10-meter subband.

The test for the Novice license will be expanded by adding 10 questions (for a total of 30) covering the new privileges. It's clearly understood, though, that the test should be no more difficult than the current Novice test. Another change requires two examiners to administer the test; the Novice testing program will *not*, however, be run under the present Volunteer Examiner system.

The present examination for Technician and General class is being split into two pieces. Each piece will deal more exclusively with the privileges that come with the license being tested for. That way, a Novice going for Technician will not have to deal with modes and techniques that apply only to General-class operation.

The complete text of the FCC's Report and Order is on page 48.

The Wisdom of Solomon

THE GOVERNMENT GIVETH and the government taketh away. It looks as if a pyrrhic victory of sorts has been achieved with the adoption of PR Docket 86-161, giving Novices 220 voice privileges for the first time! For on February 12, the FCC released **General Docket 87-14**, a Notice of Proposed Rule Making that would delete 220–222 MHz from the amateur service and reallocate it to land mobile services on an exclusive basis. 222–225 MHz would now become an exclusive amateur allocation if this NPRM became law.

It would appear that the FCC has finally tired of the long dispute over 220 and has tried to appease both sides by cutting the "baby" in half! While firm action on their part to give exclusive status to an amateur allocation on 220 is admirable, the plain truth is that a substantial number of weak-signal enthusiasts, EME operators, simplex links, and packet stations will, in effect, be forced off the air. Why? For the simple reason that the frequency segment from 222–225 MHz is already filled with repeaters and simplex operations in many parts of the country.

It wouldn't be fair or reasonable to ask those stations to vacate enough of the remaining 220-MHz allocation to make up for this displacement. Not only that, it would be very difficult, if not impossible, to consider such a redesign of subbands, especially in areas such as New York City, Chicago, and Los Angeles! There is no doubt that we all stand to lose from this proposal. The 220-MHz band is fast becoming an alternative to the congestion on 2 meters, and its unique characteristics make it well suited for such specialized modes as packet and moonbounce.

Every active ham has a stake in this NPRM—from manufacturers of 220 equipment to casual operators who rarely venture beyond the HF bands. Remember—once it's gone, it's gone for good. In the past few years, we've lost a good deal of our amateur satellite allocations through WARC, a large chunk of the 13-cm band, and from 1215 to 1240 MHz to non-amateur interests. . . largely because we weren't using those allocations and didn't present a unified front of opposition. But the technology to operate on 220 is as close as your wallet—literally speaking. FM transceivers and hand-helds abound, linear transverters can be easily had, and at least one manufacturer has spent a great deal of time developing what would be the first 220-MHz multimode transceiver on the U.S. market.

It is imperative that you write to the FCC and state your feelings about this docket. At the very least, the issue is too complex to wrap up in the short time period allocated (initial comments due April 6, reply comments due April 21). Consideration must be given to those operators and modes that will be left out in the cold by this juggling of frequencies. A strong voice now to save 220 might just save 70 cm and higher frequencies from a similar fate. Put your thoughts on paper. Be concise and avoid unnecessary diatribes. Make 12 copies of your comments and mail them to: Federal Communications Commission, 1919 M Street NW, Washington DC 20554. Make sure you clearly state the docket number (87-14) at the top of each copy. Most importantly: Do it today!—KT2B.

This is Andy Broome KB4VRU from Chattanooga, Tennessee. Andy is 9 years old and recently got his license from classes held by the John Ross ARC. Look for Andy on 40 meters, but do it fast because he's trying to upgrade so he can get on packet.

Mega-Winner

THE BIG WINNER of *73*'s Megaband Sweepstakes is Stanley P. Hill N9FXU of Oak Park, Illinois. By the time you read this he'll be firing up his grand prize: Yaesu's FT-767GX all-band, all-mode transceiver. Stan picked up the winning entry in a newsstand copy of *73* at Spectronics in Oak Park. He has been a ham for a year and is currently a Technician class. Stan became a ham so he could use a two-meter rig at work—he's a truck driver for Yellow Freight Systems. Plans for license and equipment upgrades were already in the works *before* he got the good news, but the incentive to upgrade has just gone through the roof. *73* extends our congratulations to the lucky winner and our thanks to Yaesu USA for making the Megaband Sweepstakes possible.

Call Again

THE FCC has decided to make a move on the callsign assignment system. PRB-3, released recently by the commission, states that the FCC would like to hand special call assignments over to a private organization. This way, hams could request any call that they like (remember the good old days when you could do that sort of thing?). The FCC would still issue an official license with a 2-by-3 call from the NA–NZ block, and the special call coordinator would keep a data base with a cross-index available to the commission for monitoring purposes. Written comments on PRB-3 are due to the FCC by April 23, 1987.

School Support

THE RESPONSE OF READERS to Wayne's call for people to give a special $15 subscription to *73* to the school of their choice has been heartwarming. If you missed it the first time around, the offer is still open. If you want to help the hobby grow but don't have the time to start a Novice class, please give this offer some thought. The following is a representative sample of the many generous folks who've helped contribute to the future of their hobby: George R. Susterick, Larry D. Shaunce WDØAKX, Mid-Michigan ARC, Kenneth Cody KA1BRB, Ozark ARS, James D. Garls W9SKO, William E. Newkirk WB9IVR/4, Stanley M. Grady WB4ZTF, Frank E. Kavenik WA9QJR, Robert P. Felton K7WLX, Matt Kolb NM9H, Bob May K4SE, and D. Bruce Caster WD4CSE. If you'd like to participate, send $15 and the complete address of the school to *73* Magazine, Circulation Department, WGE Center, Peterborough NH 03458, Attn: School Sub.

Hams On Wheels

WE RECENTLY received a request from Steven Rich WA1DFL, the Director of Handicapped Affairs for the town of Revere, Massachusetts, asking us to include wheelchair accessibility in our reporting of ham events. Steven writes: "Amateur radio has always had a strong tradition of brotherhood and sisterhood regardless of physical ability. In keeping with this tradition, I would respectfully request that clubs when advertising classes, exams, meetings, flea markets, and hamfests let it be known if the event is wheelchair accessible." The vast majority of Special Event listings that we receive do NOT mention wheelchair accessibility. How 'bout it, publicity chairmen?

Feedback

YOU MAY HAVE NOTICED that the Feedback card is missing from this issue. We've got mountains of them still to process. Feedback will return on an occasional basis. Thanks to all who participated.

NEVER SAY DIE

from page 4

in the country—minutes around the world.

I'm sure there is still a need for a message handling system that takes a month to deliver the messages. Let's see now, what would we use that for? What a wonderful system to have in place for use in times of emergency, right? And that's supposed to be one of the reasons for the National Traffic System, I believe. Yes, I'm being sarcastic.

When I got involved with RTTY back in 1948, I was impressed by the speed and accuracy of digital communications. We had to build our own converters at first, but as commercial equipment came on the market I expected the traffic handlers to go for it. In 1950 we had a RTTY repeater and network set up so any RTTY op in the Greater New York area could leave a message at an unattended station—complete with an acknowledgement of receipt. It seemed like an ideal system for emergencies and traffic handling.

So here we are, almost 40 years later, and we're still banging out messages with hand keys and taking near a month to get 'em halfway across the country—from Kansas to New Hampshire. Wow! Is it any wonder we have a shortage of youngsters interested in "enjoying" our hobby? Oh, we've made a little progress. Vfo's replaced crystals in the 40s. Sideband replaced AM in the 60s. Repeaters replaced simplex in the 70s. Nothing has yet replaced the dull QSO, the traffic handling, or the DX pileups of the 30s.

One thing modern business has recently relearned from the past—the customer is right. If you've read the business success and the excellence books, you know the most successful businesses are those that provide the products and services their customers want. They keep asking what's wanted—and provide it. Amateur radio has been particularly resistant to this philosophy, with the same results we've seen in business—imminent bankruptcy.

Even the most insular of amateurs is aware by now that all is not well with amateur radio. I'm not the only one pointing to our lack of growth—our geriatric membership—our lack of technical progress in the last twenty years. Indeed, you don't hear anything else these days—even from the ARRL.

Perhaps it's time to look at amateur radio as if it were a business—a nonprofit business, but still a business. Thus, if we're going to keep our business going we're going to need new customers to replace those who lose interest or die—or both. If we're not holding the interest of customers—and not attracting new customers in adequate numbers to stay in business, it's time to ask the customers and potential customers what they want that we're not providing.

One has to be deaf not to hear the chorus asking us, "Why Morse code?" Yes, there sure are a lot of deaf hams—at least as far as this emotional subject is concerned. They don't want to even hear about it—and there's no way you can get them to actually think about it.

The closest thing we have in amateur radio to a corporate organization is our only national society, the ARRL. This puts the onus on the League to provide us with guidance and leadership. The League got to be the one and only by killing off every upstart group that threatened their power. With that power is responsibility—and one of the major responsibilities of any corporation is to make sure the firm survives.

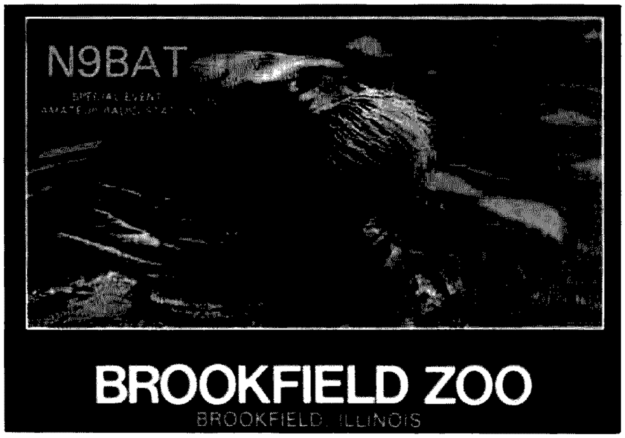
Corporate executives who turn a blind eye and ear to the firm's prospective customers would normally be ousted by the board of directors. In turn, directors who ignore the needs of customers, even over the advice of their executives, would quickly be replaced by the shareholders.

In the amateur radio hobby, the corporation is the ARRL, the executives are the HQ gang, and the directors are those you elect every two years in your division. You, as an ARRL member, are the shareholders.

I've talked with most of the HQ gang and I think they're by far the best bunch I've seen at HQ in 50 years. I wish I could say the same about the directors. Alas! Darn, there I go again, attacking the League. Or am I? From my viewpoint I see a serious problem—and I have what looks to me like a simple proposed solution—one with which I think you'll agree, if you're able to think about it.

Let's go back to the analogy of our hobby and a business. If we want to keep it going, we have to provide services which in some way pay for our license to use public property: our frequencies. We've let our customer base grow old and feeble and have resisted attracting new customers. Am I being unfair to suggest there's an element of responsibility for the League to solve this problem?

The League is an $8 million a year business these days. That's about the same order of magnitude as my *Digital Audio* magazine, so I have a fair grasp of what it takes to run that size business. Businesses of any size have boards of directors (like the



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0745-080X) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

League). Since I'm on the board of several corporations, including one projected to reach $1 billion in sales in a couple more years, I'm quite familiar with the responsibilities of directors.

Boards of directors are normally made up of experienced and successful business executives. They're experts in marketing, technology, financial management, and so on. And here's where I see the basic weakness of the League—a weakness that has kept the ARRL from providing our hobby (its business) with the leadership to keep it strong and healthy.

When you get your ballots to vote for your next director, what do you see on each one? You know what you see—a list of the ARRL appointments he's held. In many cases he's come up through the traffic system, so we know he's probably a true believer in Morse code for everyone. How many bios have you seen citing business experience—business success—including marketing, sales, financial, and other experience which is fundamentally a part of a director's responsibility? We seem all too often to elect teachers, who haven't a clue as to how to run an $8 million business.

A business-savvy ARRL board would, I'm convinced, have started working years ago on getting school radio clubs going so we'd have the infrastructure to bring the League new customers. And they'd have kept current with customer needs through surveys—making the needed changes to keep the hobby growing—even including a no-code license.

"I did the same as you with the last ballot—I looked over the candidates—noted their years of ARRL service and myriad of appointments—sighed, shrugged, and tossed a coin."

The boards of corporations that ignore the customers find their corporations under attack by raiders. Indeed, with virtually no exceptions, recent corporate raids have been brought on by boards of directors that have let their corporations weaken to the point where the directors should be replaced.

In the ham field, the responsibility comes right down to you. It's the unwillingness of most hams to be involved with ham politics that has allowed so many hopelessly incompetent hams—good solid Morse men, to be sure—to become ARRL directors—the biggest ego trip our hobby has to offer. Neither you nor your club has ever written to the candidates to find out if they have been successful in business—perhaps even with some experience as a director of other corporations.

No, despite my tone of attack, I'm really not blaming you. But I will blame you if you let this situation continue. No, I have to say flat out that it's my fault. I should have made this an issue long ago. Oh, yes, I did write about it a few years ago—but I didn't keep after you. And you're like me, if someone doesn't hassle you, you forget. I did the same as you with the last ballot—I looked over the candidates—noted their years of ARRL service and myriad of appointments—sighed, shrugged, and tossed a coin.

The board elections are geared so there really isn't time to get the business background (or lack of it) into print in *73* between the time we know who's running and the mailing of the ballots. One of these days we may get amateur radio set up so we're able to actually communicate in less than three months, but I hesitate to even guess when that'll be.

Tell me, if you were an ARRL director, would you think it important to update the National Traffic System by about 50 years?

If you agree and have some constructive ideas, I'd like to hear from you. If you disagree and can express your ideas in other than blind, emotional hate terms, please write. I've tried to get across my ideas on where we are and how to make things better—now I'd like your ideas. I reserve

Continued on page 50

LETTERS

TICKET SALES

For seven years I have had zero luck getting my wife interested in studying for her license. February's Never Say Die regarding the selling of Extra-class licenses did the trick. There are a few modifications we would like to see, however. A regional center for license sales should be set up in each zone to give everyone equal access (Puerto Rico is just too far from 6-land). Mail order would also be a good idea, but it might let in too many people and overwhelm the repeaters. An Extra-class license is just not necessary—a General for $50 would be adequate. In order to maintain the integrity of the traditional licenses, a special prefix would be assigned to purchased licenses. This would allow the real hams to ignore the new pseudo-hams if they want to talk about technical things such as the weather and their latest medical operation.

John R. Fielder N6DAO
Los Osos CA

Ever since the news broke about licenses being sold, 73 has been deluged with calls and letters from people begging us to tell them who to get in touch with in Puerto Rico or New York. We won't say. We don't feel bad for those who can't be bothered with learning code and theory, but when folks who have been earnestly trying to become hams for years call, it's tough to tell them to wait for "no-code."—Eds.

NOVICE NEEDS

I just got my Novice ticket and a subscription to *73*. I guess I got taken in by the eclectic rambling of your magazine's salesman, Wayne. Now, please look over your table of contents and tell me what's in it for me. How about a Novice corner—basics about how an antenna tuner works, the difference between a vertical and a dipole—you get the point. Take a look at other hobby mags. They realize that the newcomer to the craft must also be addressed.

Morris Bleckman KA9WIA
Lincolnwood IL

Take a look at page 78. 73's long search for a Novice columnist has finally ended.—Eds.

PULL TOGETHER

I believe every ham who hides his hobby and doesn't even try to train a new Novice every year should either shape up or turn in his license. When I pass my Novice exam some time in 1987, each year thereafter there will be a new Novice or student on his way to a license or you get to rip up my license. I may be a non-ham upstart to some, but either we all pull together or lose amateur radio. Either live your creed or roll over and die.

Keith Martin
Lewiston ME

> **"A regional center for license sales should be set up in each zone to give everyone equal access."**

MORSE FOR MOPPETS

Thought you'd be interested in the ham radio presentation Ken Fisher WØMJD and I made to eight kids at our local grammar school. We were part of the Gold Dust program of the West Side school, in which volunteers expose first-to-fifth graders to music, arts, crafts, hobbies, etc. We presented Morse code to the kids and taught them the first six letters—a, e, i, m, t, and n—and closed with a packet radio demonstration. I made up Certificates of Completion on my computer (got the idea from "Future Hams of America" (*73*, July, 1986), and the kids were really impressed with them. Most picked up code quickly, and some very intelligent questions were asked, like "Why is shortwave called shortwave?"

One mistake I made was not to notice that one lad was hard of hearing. The teacher noticed the special attention I was trying to give him and told me of his condition. We obtained a hearing aid for him which did help, but it was too late: He already was embarrassed in front of his friends.

For the demo, we made up personal messages for the kids from information we got from the school secretary beforehand, and Ken installed them on a local packet bulletin board. Then he allowed each kid to call up his own message! This went over really big.

Feedback has been positive from both kids and teachers. Check your local schools for similar programs or consider championing such a program yourself. The enthusiasm of the kids can be contagious.

Ron Kyles KJ4NA
Elizabethton TN

A super idea!—Eds.

"NRA TYPES" I

I did not appreciate KW1O's remark about "NRA types" in the February Letters column. That is no different than calling all hams "lids." Many hams are NRA members and I am sure they did not like your derogatory statement.

Karl Burket KC7JU
Payette ID

"NRA TYPES" II

Being a life member of the NRA, I object to the negative connotation that KW1O seems to give to the NRA and its members. If amateur radio had as effective an organization as the NRA does working on its behalf, ham radio wouldn't be in the mess that it's in. I think that hams, and especially the ARRL, could stand to take a few lessons from us "NRA types."

John Aultman KA5UBL
Hattiesburg MS

"NRA TYPES" III

I was shocked after reading KW1O's reply to KH6GPI referring to: "NRA types who haven't really thought much about what they're saying—they just mimic words that they have heard from other 'activists.' " Perhaps KW1O felt safe in unburdening himself in *73* since the implication would be that NRA members are too stupid to pass a ham radio exam and consequently not read *73*. This "NRA type" passed both elements of the Extra-class exam 100% correct at age 65. I will not lower myself to KW1O's level and attempt to typecast him. He did it himself through the above-quoted slur.

Evert Skough N7HID
Kingman AZ

The Letters column of 73 is not an appropriate place for the expression of non-ham-related personal opinions. 73 apologizes to those who were offended by the analogy.—Eds.

SAY DIE

Your Never Say Die column is becoming very repetitive. Please spare us the time reading about how great you are. We all know how great you are. After all, you have been telling us how great you are in every column since you came back. Give the space to the Letters column—it is much more interesting.

Arnold D. Samuels KH6COY
Ocean Shores WA

NEVER SAY DIE

Your editorials are completely outrageous. How do you get away with it? I have only one thing to say—welcome back! I'm a born-again subscriber since you've returned. I'd buy your magazine for the editorials alone—the rest is gravy.

Jerome Prismantas NØHFC
Organ NM

COSMIC COMPARISONS

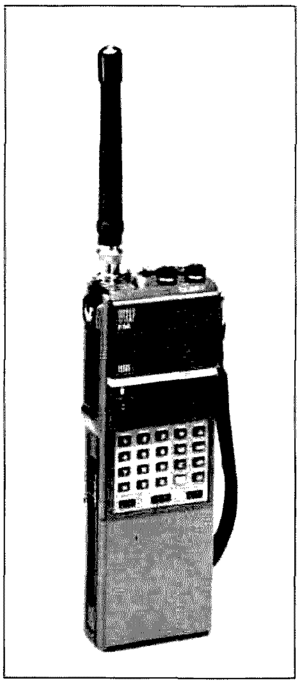
Concerning the story "Cosmic QRN" (February, 1987), W6HDM evidently thinks like Carl Sagan. Sagan's book *Contact* details the fictional story of the reception of our first extraterrestrial communication. Parallels between the two stories include frequencies and multiple coding methods in a single signal. The two stories make great comparison pieces.

Charlie Cotterman KA8OQF
Dayton OH

NEW PRODUCTS

YAESU FT-109RH AND FL-7000

Yaesu U.S.A. announces the FT-109RH, a 5-Watt, 220-MHz hand-held transceiver as a follow-up product to the FT-209RH and FT-709R hand-helds. Covering 220 to 224.995 MHz in 5-kHz or 10-kHz steps, it includes battery-saver, 10 memories, standard 1.6-MHz or nonstandard offset, and memory and priority scanning. It is equipped with a DTMF tone generator, front-panel multimeter indicating battery condition, transmitter power output, or received signal strength, and a VOX system. Optional accessories are interchangeable with other units in the 109, 209, and 709 series.



Yaesu's FT-109RH 220-MHz hand-held.

Yaesu has also introduced the FL-7000 solid-state linear amplifier for 160 through 15 meters. It features an automatic antenna tuner with automatic bandswitching when used with a Yaesu FT-757GX, FT-767GX, or FT-980 transceiver. Antenna switching also is automatic with the FAS-1-4R remote antenna selector. Power input is 1200 Watts for approximately 70 Watts; a protection circuit prohibits operation with high swr until the antenna tuner completes the matching process. Thermostatically controlled dual fans run even when the amplifier is turned off if they are still needed for the dissipation of heat.

Further information on these Yaesu products may be obtained by checking Reader Service number 206.

MERCER POCKET DMM

Mercer Electronics is offering a new low-cost digital multimeter, the model 9345. A single rotary disk allows selection of the quantity to be measured and provides automatic measurement on all functions. It measures volts and Ohms, has a high-contrast LCD display, and has audible continuity indications. It comes with carrying case and batteries for $34.95.

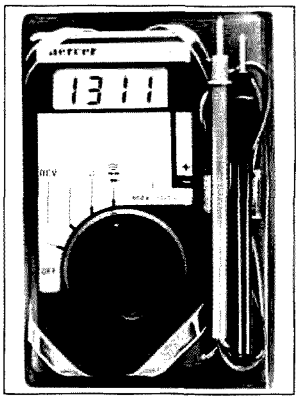
For more information, please circle Reader Service number 209.

MFJ COMPACT SPEAKER AND NEW ANTENNAS

MFJ Enterprises, Inc., is releasing its new compact mobile speaker with magnetic base and tilt bracket, the MFJ-280. Equipped with a 3-1/2-mm phone plug on a long cord, it works well with all 8- and 4-Ohm impedances and can handle up to 3 Watts of audio. At $18.95, it is backed with a one-year unconditional warranty.

MFJ is also offering three new antennas. The MFJ-1710 is a 3/8-wave, 2-meter, telescopic with BNC. It comes with a pocket clip and is 5-3/4" collapsed and 24-1/2" extended ($9.95). The MFJ-1712 is a 1/4-wave, 2-meter; 5/8-wave, 440-MHz, telescopic with BNC that is 7-1/4" collapsed and 19" extended ($14.95). The MFJ-1714 is an end-fed, half-wave, 2-meter telescoping dipole.

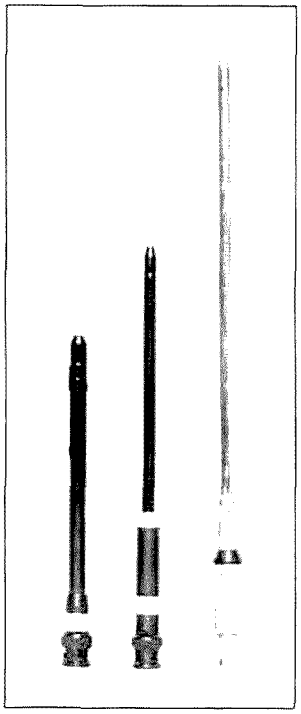
For additional information about these MFJ products, check Reader Service number 207.



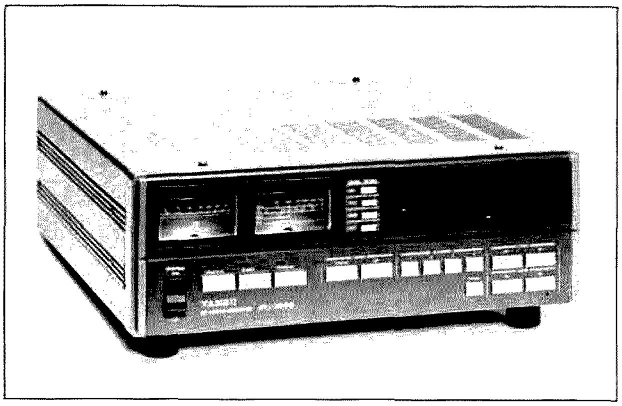
Mercer's model 9345 pocket DMM.

REGENCY INFORMANT AND TUBBO-SCAN 800

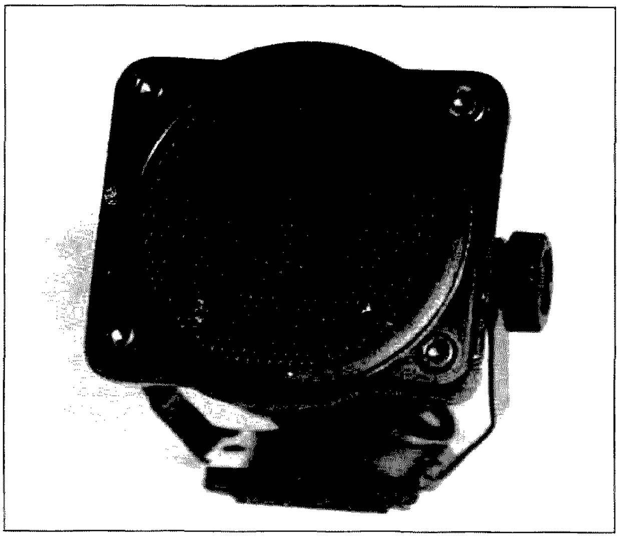
Regency Electronics, Inc., has introduced the Informant and Turbo-Scan 800 scanners. The Informant, preprogrammed with key state and local law enforcement frequencies for all 50 states, will search VHF and UHF police frequencies for any state with a single touch at four times the speed of most scanners. A weather-search function scans for the nearest National Weather Service frequency. The display shows



New antennas from MFJ.



Yaesu's FL-7000 solid-state linear amplifier.

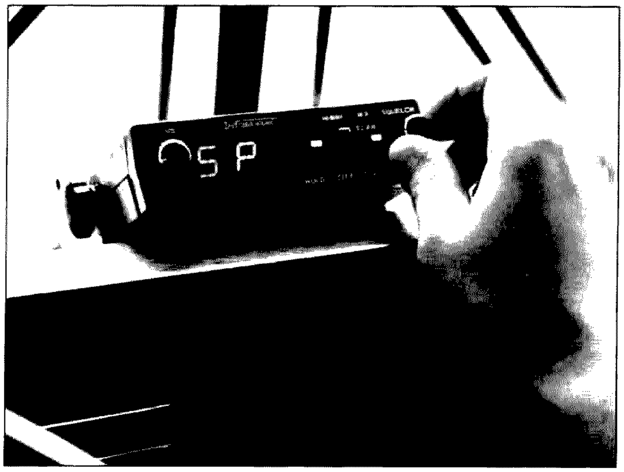


MFJ's compact mobile speaker.

state and type of transmission (state or county police); there is a highway/city switch for choice of monitoring local or statewide frequencies, and a hold switch to keep the receiver on a single frequency. The radio comes with a multi-position mounting bracket/clip to fit any vehicle. It includes a telescoping antenna. Wiring can be direct to dc or through a cigarette lighter adapter. The suggested retail price is $369.95.

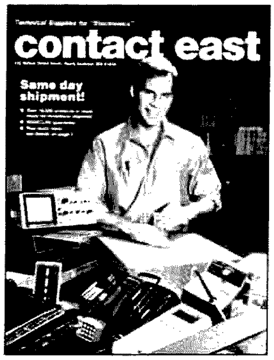
The Turbo-Scan 800 "scans nearly five times faster than any competitive model" and provides wide coverage of 12 of the most popular 800-MHz public-service frequencies. It has a translucent, rubber keypad, backlit for night use, and dual-level vacuum-fluorescent display. Frequencies may be entered into any of the scanner's 75 channels or grouped into any of the six scan banks. Channels may be retrieved instantly, without having to manually step through all other channels. This rig also has the weather-search function. Designed for home or mobile use, it has a suggested retail price of $499.95. Model TS-2 comes with two telescoping antennas (for standard VHF and UHF as well as 800-MHz reception), ac power supply, dc power cord, and mobile mounting bracket.

To obtain more information about these Regency scanners, circle Reader Service number 208.

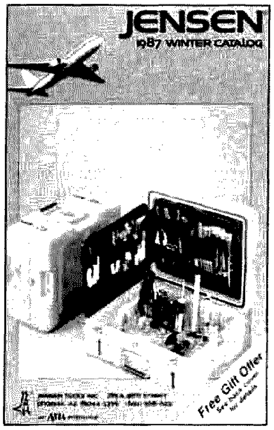


The Regency Informant public information radio.

NEW CATALOGS AND BOOKS



Contact East. Comprehensive product guide for 1987 featuring a full line of tools and instruments for electronic specialists, engineers, technicians, involved in assembling, testing, and repairing. Free, including one year of technical supplements. Circle Reader Service number 210.



Jensen Tools, Inc. Catalog of service and maintenance kits, hard-to-find tools. VCR alignment, communications adaptor kits, AT&T handsets, digital test equipment, lighting/optical aids, soldering stations, computer accessories, more. Free. Circle Reader Service number 211.

QSKY Publishing. A primer on data communication written for the beginner level: *The Digital Novice*, by Jim Grubbs K9EI, with cartoonist Tad Barney, 128 pages. Twelve chapters, on everything from Morse code to packet radio and future uses for digital communications. ($12.45 ppd.) For more information, circle Reader Service number 212.

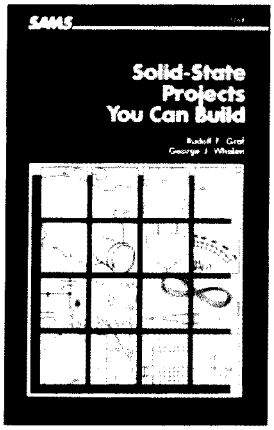
Howard W. Sams & Company. Publications: *Audio IC Op-Amp Applications*, 3rd Ed., by Walter G. Jung; 336 pages. Completely revised; includes devices such as very-high-slew-rate and dynamic-range FET-input units, and new applications circuitry. #22452, $17.95.

First Book of Modern Electronics Fun Projects and also *Second Book. . .*, both by Art Salsberg, both designed for the electronics hobbyist to expand his knowledge through practical fun learning; 20 hands-on projects in each, from the pages of *Modern Electronics* magazine, each is 256 pages. #22503 (#22504 for the second one), $12.95 each.

Forrest Mims' Circuit Scrapbook II, 272 pages. Some 70 projects from *Modern Electronics'* columns, the "Electronic Notebook." Transistor, MOSFET, analog, digital circuits, LEDs, laser diodes, optoelectronics, sensors, assembly tips. #22552, $19.95.

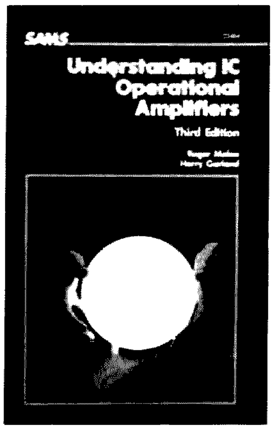
Radio Handbook, by William I. Orr—23rd Edition, 640 pages, hardbound. Completely revised. #22424, $29.95.

Shortwave Radio Listening with the Experts, by Gerry L. Dexter, 528 pages. Features 25 contributors who are shortwave listening researchers, pioneers, and specialists, as well as veteran listeners. #22519, $22.95.



Solid-State Projects You Can Build, by Rudolf F. Graf and George J. Whalen, 176 pages. Complete step-by-step construction procedures, illustrated, with background theory, parts lists, tips on where to get hard-to-find components. Projects include: electronic dice, computing thermometer, proximity or touch alarm, TV remote-sound system, singalong light controller. #22500, $10.95.

Understanding Electricity and Electronics Principles, 256 pages; *Understanding Electricity and Electronics Circuits,* 328 pages, written by Training & Retraining, Inc., revised by David L. Heiserman. # 27061 (*Principles*) and #27062 (*Circuits*), each $14.95.



Understanding IC Operational Amplifiers, 3rd Ed., by Roger Melen and Harry Garland, 224 pages. New, expanded, and updated applications include material on computer-aided design techniques and IC op amps in microprocessors. #22484, $12.95.

For more information about these Howard Sams Books, circle Reader Service number 213.

73 Review

DJ2UT XP706 Multiband Beam

Sommer GmbH
Distributed by:
H. J. Theiler Corp.
PO Box 5369
Spartanburg SC 29304
Price class: Semi-assembled $778
Unassembled $662

by Jim Godron N1EJF

More than 10 years ago, a German amateur named Walfried Sommer DJ2UT decided that there must be a way to overcome the trap losses induced when a yagi was tribanded for 10, 15, and 20 meters. He also wanted to develop the high gain (7 dB or more) and the excellent front-to-back ratio that can be achieved on a monoband antenna by close (0.1λ) element spacing on a multiband beam. This presented him with the monumental task of overcoming the very narrow bandwidth and extremely low resistance (10 Ohms or less) of those closely spaced designs. After reviewing the work of Rucker, Buchanin, and others and after spending many years in development, Sommer refined his design to that which is available today.

Design

The operating principle of the DJ2UT antenna is quite remarkable. On 20 meters, the system is a full-size beam using 1/2λ elements without traps. The main difference between this system and others is that all elements are driven with a phasing line. In effect, you have a 4-element log cell that develops an impressive 9 dB of gain and an excellent front-to-back ratio.

On 15 and 17 meters, the 20-meter elements are about 5/8λ long. This results in a high feedpoinl impedance that must be reduced. Instead of using the LC traps commonly found on multiband antennas, Sommer uses the capacitance found in the phasing line, in conjunction with the three or four elements (depending on the model) clustered around the feedpoint. It is this combination of driven and parasitic elements that lowers the system's impedance and provides more than 8 dB of gain on 15 meters.

On 10 and 12 meters, the 20-meter elements are about 1λ long and are fed by the phasing line as split 1/2λ elements in a collinear fashion. Gain on 10 meters is more than 10 dB.

On 30 and 40 meters, the system ignores all but the longest elements. In this configuration, it can be considered a dipole with a transmission line attached. These elements are too short to be resonant on 30 or 40 meters and present a capacitive reactance that must be eliminated. On 30 meters, this is done with an LC match; on 40 meters, a coil and/or a coaxial capacitor is used.

It is extremely important to note that these networks are NOT connected in SERIES with the antenna and that they cancel only the "blind" reactive components. They ARE NOT

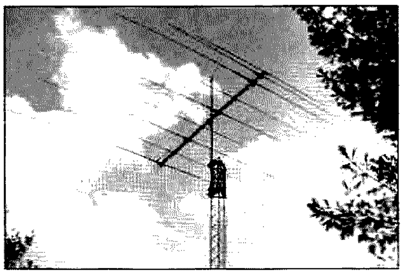


Photo A. The DJ2UT XP706 multiband beam.

traps. There is some gain on 30 and 40 meters as compared to a conventional 1/2λ dipole. Because the bandwidth is narrow on 40 meters, the resonant frequency can be easily adjusted.

All the gain figures presented for this antenna are as compared to a 1/2λ dipole, NOT to some mythical reference (the figures presented are the manufacturer's claim, but my experience is that his claims are *conservative*). Sommer goes to some effort to test the performance of his antennas. The figures become really impressive when you consider that this kind of performance is accomplished on a 20' boom!

Antenna Assembly

Construction of an antenna system this complex requires some effort. Having said this, I'm pleased to report that I experienced no real problems putting this antenna together.

When this series of antennas was introduced to the U.S., the instruction package left something to be desired. Pete Theiler has spent considerable time translating and rewriting the instructions. While some improvement can and will be made, I think Pete has done a terrific job.

My antenna arrived on a Thursday. I spent the first day reading through the instructions, and began construction on Friday evening. Fortunately, I was able to assemble most of the antenna (element holders, phasing line, etc.) in my basement, as I was working just after a 1-1/2' snowfall. I concluded the inside phase on Saturday, and on Sunday I verified all measurements and the tightness of all connections.

Putting the elements on the antenna was very straightforward. Each element is color-coded and the measurements on the chart are easy to follow, although they are metric. This wasn't a problem for me, but, if you're worried about cm, mm, and stuff like that, the consid-

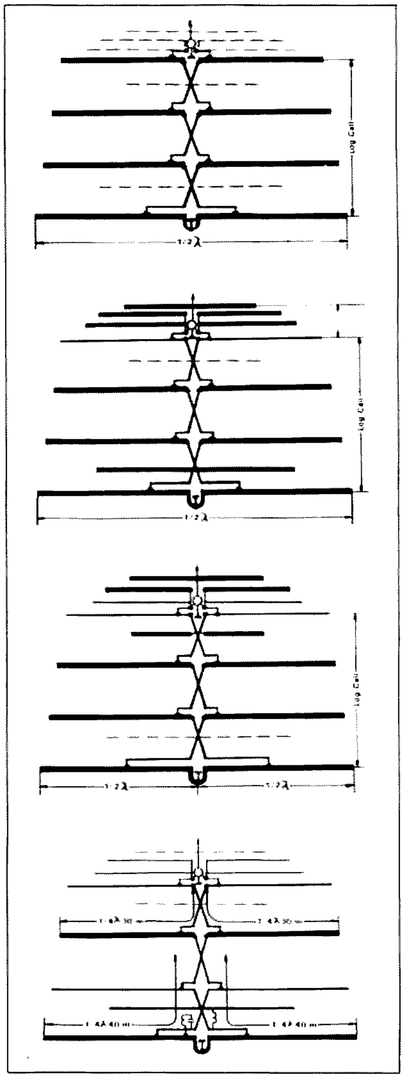


Fig. 1. The Sommer multibander's active elements are shown as bold; the inactive elements are shown as a broken line. From the top down, these configurations are for: 20 meters; 15/17 meters; 10/12 meters; 30/40 meters.

erate folks at Sommer even include a metric ruler for your convenience.

The nuts and bolts are also metric, so a metric wrench is also supplied with the antenna. While it is possible to assemble the antenna using only this wrench and common hand tools, I found that my collection of metric tools was most helpful.

As I was assembling this antenna, the one thing that became clearer and clearer was the quality of the materials and engineering. The wall thickness of the element tubing is greater than that on U.S.-made beams that I've examined. The element holder castings are massive, weighing several pounds each. Every piece of this antenna is first-rate and designed to last a lifetime. All connecting pieces, U-bolts, nuts, and bolts are stainless steel.

I installed the antenna on a Glen Martin Engineering tower and Hazer unit. (If you're

not familiar with the Hazer, please see my review below.) The rotor and thrust bearing mount on the Hazer unit, which travels up and down the tower. By bringing the Hazer to its lowest position (about 2' above the ground), you can mount the antenna at a very convenient height. It's possible to attach or work on the antenna by using only stepladders. With a beam of this size, that was a distinct advantage.

Performance

In use, this antenna performs better than I expected. My first contact was with a station in California. I was running only 100 Watts, but my signal was three S-units better than his and he was running a kW into a conventional beam. Regardless of distance, single hop or long path, my signal was one to three S-units better with 100 Watts than stations running linears into conventional antennas.

The antenna is absolutely flat across 20 meters, and on all other bands the swr is below 1.7:1. While not very broadbanded on 40 meters, the antenna's performance is quite good. Pete tells me that a modification will soon be out that will make the bandwidth broader, and I'm looking forward to trying it out.

Conclusion

This beam performs as well as monobanders. While its cost may at first seem high, it is actually very reasonable when compared with what you would have to spend to get comparable performance with other antennas. It makes a good investment when you make the transition from wire antennas, as this antenna will provide gain on receive (while a linear works only one way). Don't think I'm knocking linear amplifiers; I'm not. It's just that if you optimize your antennas, any subsequent increase in output power works better.

If you're serious about DX, appreciate quality, or want an antenna that you can leave to your children, you should give serious consideration to this system. Quality is never cheap, but the value represented by your investment will remain through the years. If you would like more information on this antenna, please circle Reader Service number 204.■

Glen Martin M185A Tower

by Jim Godron N1EJF

Glen Martin Engineering
PO Box 7253
Boonville MO 65233
Price class: $1,275

It's not every day that a ham gets to install a new tower. And when he does, it's usually a difficult project and just plain hard work. When I was presented with the opportunity to set up and review a 40' Glen Martin Engineering tower complete with Hazer unit, I decided to make the job as easy as possible. In my book, that means planning everything so that there are no surprises.

The tower I installed was a 40-foot M185A. It has an 18" face, is triangular, and is of bolted aluminum construction. Besides being very strong, the tower is also very light; the shipping weight of the complete tower and Hazer unit is only 140 lbs.

Choosing the Site

The first step in a major project like this is planning the foundation. Because this tower is free-standing, it requires quite a substantial foundation—a finished size of 40" x 40" x 6'. This represents about 2.5 cubic yards of concrete, far more than could be mixed by hand and more than most people would want to mix on site.

Therefore, you should be able to get a cement truck within 10–16 feet of the location. If you cannot, the choices are to move the site or to bring the cement to the site in wheelbarrows. By the way, moving cement in wheelbarrows is NOT FUN and it takes a LONG time.

I chose the area directly behind the garage for my tower, mostly because that's where my wife said I could put it. Our garage is connected to the house by an enclosed breezeway. With the use of two cement chutes, we could pour cement through the breezeway and into the form.

Preparing the Site

Now that the site was chosen, the next step was to dig a hole. I briefly considered using a shovel, but reason prevailed and I decided to use a backhoe. But, due to a major sewer construction project in our small town, there was only one available at noon on an especially rainy day. When the operator had dug a hole about 6' wide by 10' long by 6' deep, he got the machine stuck in the backyard. It is incredible what carnage a large machine like that can cause to a newly seeded lawn.

A structure this large should really be poured into a form. It's not absolutely necessary, but in the long run it's easier. If you're not an experienced woodworker, you should plan to spend about eight hours building the form.

I constructed two stud walls 6' tall and 40" wide, and covered with 1/2" CDX plywood. I then cut another two pieces of 1/2" CDX 4' x 6' and "banded" these together in five places (see Photo A). I assembled the four pieces of the form in the hole and connected each joint with nails and screws. It is also a good idea to screw the overlapping plywood to the stud walls. After you pour the concrete, you may elect to strip the form or simply backfill around it.

The pouring of the concrete was almost anticlimactic. We pounded a ground rod into the undisturbed ground under the bottom of the form and connected it to the steel base support. The base was held above the form with a two-by-four and a piece of furring so that the bolts would stick out of the concrete the proper distance.

You will notice in Photo B that I didn't completely backfill around the form. This allowed me to strip only the top of the form. I had ordered 2.5 cubic yards of 3,000-lb. concrete and had virtually none left over. After the concrete set, I removed the base assembly, stripped the top of the form, and applied silicone grease to the bolts to keep them from rusting.

The Hazer Unit

The Hazer unit itself appears to have quite a few parts, but assembly took only about two hours. The completed unit stands 4' tall with the thrust bearing mounted on the top plate and the rotor mounting plate on the bottom. When the unit slides up and down the tower, it rides on nylon studs. There are two studs at each corner (a total of 12) and extras are provided.

Photo A. The form "banded" together.

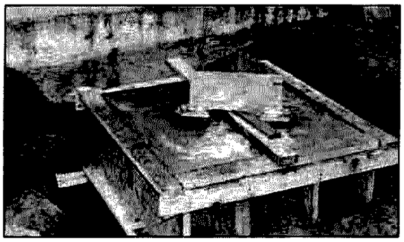


Photo B. The area around the form is partially backfilled after the concrete has been poured.

In Photo C, you will notice the safety mechanism. The arm must be held away from

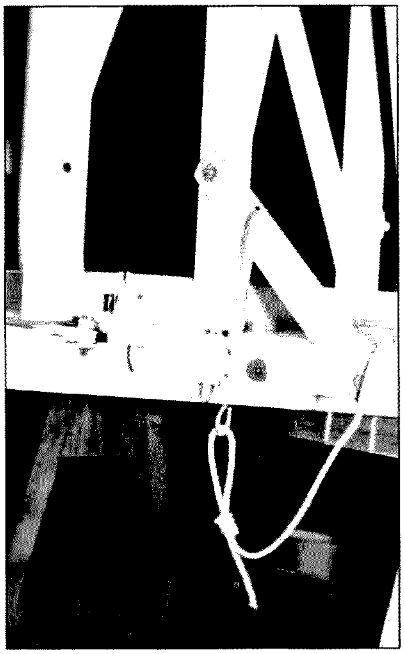


Photo C. Close-up of the Hazer unit, showing the safety mechanism.

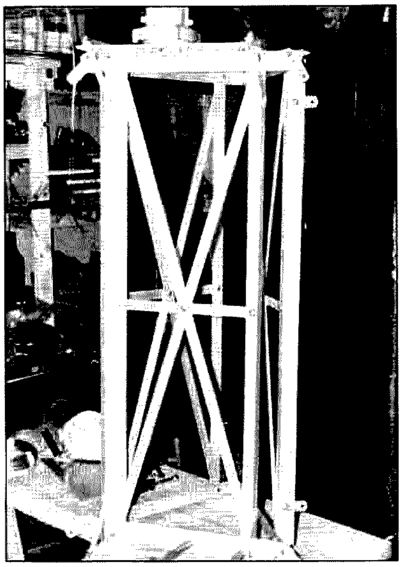


Photo D. The Hazer unit.

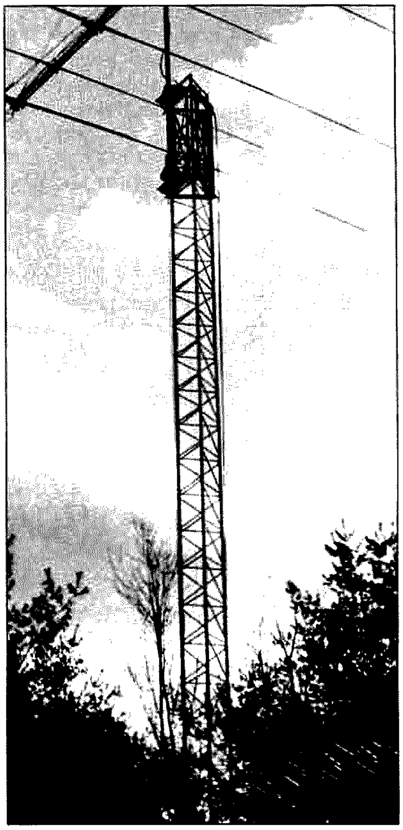


Photo E. The Glen Martin Engineering M185A tower with antenna attached.

the tower while you are lowering the antenna or the Hazer will stop at the next crossbar. The spring that holds the safety bar up is stainless steel. The safety action of this device is "deadman"; if you let go of everything, the downward motion of the antenna stops.

From Photo D, you will notice that there is a lug with a hole mounted in each corner. On taller towers, you can attach the top set of guys to these lugs, or you could use them to hold one end or the middle of a wire antenna. I brought my coax and rotor cable to the bottom right lug and then ran the coax up past the thrust bearing and attached it to the lugs on the right side and upper right corner.

The stainless-steel winch cable passes through the bottom and top plates and then over a pulley mounted at the top of the tower. The cable then goes down the inside of the tower and connects to the winch. The centerline of the mast and rotor pass off the side of the tower; this way, the antenna boom will miss the tower and the entire platform can travel up and down the tower.

The antenna must be pointed in one certain direction as it's raised or lowered. As a matter of convenience, I aligned the tower so that this position would be north. It doesn't make any difference what direction you use, but I think it's easier to use north, south, east, or west.

One thing to consider when using a system like this is that because it's so easy to move the antenna up and down, you're probably going to move it frequently. Because the coax isn't connected to the tower, it needs to be strong and flexible.

I discussed these problems with Joel Knoblock of The RF Connection and he made what I think were the perfect suggestions. We ran International 9086 from the shack to the base of the tower and terminated it with an in-line N splice to International 9095 (called Ultra-Flex), which is a 50-Ohm cable with a .405" o.d. (the same as RG-8).

The center conductor is 11 gauge (made up of 24 strands of 19-gauge copper wire). The shield is 98% and made of copper. The result is a very strong cable that stays flexible to temperatures near 0° F. It is rated to 1,500 Watts and costs only pennies a foot more than RG-8. The International company is located in Arlington Heights, Illinois. More information can be obtained from The RF Connection (213 North Frederick Avenue #11, Gaithersburg MD 20877; 301-840-5477).

The Tower

The tower itself consists of 10-foot sections made up of angled legs and tubular cross braces. The braces are bolted to the legs with stainless-steel carriage bolts and self-locking nuts. The tower sections are attached with a plate bolted to the inside of the leg. By using this method of joining the sections, you will not disturb the centerline of the leg. If the tower is damaged, the bad area can be cut out and the tower reconnected anywhere along its length. The legs are punched with square holes to catch the carriage bolts, and the tubular braces have their ends flattened and drilled.

So that I could fully experience the variations in construction, the factory shipped me two assembled and two unassembled sections. The only tool required is a nut driver or wrench to tighten the nuts. To make things easier, I put the nutdriver bit in my variable-speed drill.

It took me about 1-1/2 hours to assemble one of the sections, an hour to assemble the other. I found that the punched holes and drillings were extremely accurate and I had no trouble with the assembly. You can order sections assembled at the factory for an additional $25. If you're short on time, spend the extra money; if not, I think you'll enjoy the experience of putting the sections together. One thing that I hadn't thought about before my tower was delivered is that because aluminum is so light, the freight charges are much less than those of steel towers.

The bottom section of the tower bolts to a hinged assembly, which in turn attaches to the three studs protruding from the concrete foundation. The hinged plate sits on nuts so that leveling can be easily accomplished. When the plate is level, lockwashers and nuts go on top. I set the first section and made sure the whole thing was level and plumb. Then I hinged it over and attached the other sections.

With the complete tower lying on the ground, I positioned the Hazer unit on the middle of the top section and attached a rope to the Hazer to help lift the tower. My kind XYL, Donna, our two children, and I lifted the tower. We got the tower as high as we could (about 45 degrees) and supported it with a ladder. We lifted it the rest of the way by using the rope and the car. All in all, the whole thing went very smoothly and took only an hour or so.

After the tower was up and secure, it was a simple matter to lower the Hazer and disconnect the rope. The Hazer comes drilled for Kenpro rotors, and my Kenpro KR-2000 fit exactly. If you need the unit drilled for another

type of rotor, all you have to do is let the factory know.

If you've ever had to install a large beam on a tower of any height, you'll be amazed how easy it is to do with the Hazer. You simply lower the Hazer, and then two people can attach the LARGEST antenna by using only stepladders. My 20-year-old daughter, Andrea, and I installed a Sommer XP706 (which weighs 110 lbs., and its longest element is 32 feet) by ourselves in only two hours!

Conclusion

In use, the tower and Hazer unit work extremely well. At 40', the tower is free-standing even with an antenna as large as the XP706. During a recent severe winter storm, I became concerned because winds were forecast to be quite strong. I simply lowered the antenna and didn't give it another thought all night.

I must admit that before this experience I was a dyed-in-the-wool steel-tower user. However, the many advantages in maintenance, ease of erection, and strength vs. weight have convinced me that aluminum towers deserve serious consideration.

Even if you have a steel tower, you can still enjoy the freedom from climbing that the Hazer offers. There are models available for Rohn towers. For the ham who can't or doesn't like to climb, the Hazer provides a way to perform the annual maintenance that your beam deserves. Circle Reader Service number 205 to receive additional information about this tower. ■

Kenwood TS-711A 144-MHz Multimode Transceiver

by Peter H. Putman KT2B

Trio-Kenwood Communications
1111 West Walnut Street
Compton CA 90220
Price class: $900

For those readers who've been wondering if they perhaps missed a product review of the Kenwood TS-711A 2-meter multimode transceiver in some past issue of *73*... relax. You didn't miss it. The TS-711A has been on the market for a few years, but somehow got overlooked in the accumulation of items that are selected for review each year by the *73* staff. Why, we even managed to take a look at the companion 70-cm unit, the TS-811A, last June! Finally, at long last, a TS-711A showed up at the offices of WGE a few weeks ago, courtesy of Kenwood, so I seized the opportunity to put it through its paces.

The TS-711A comes in a package about the size of Kenwood's popular TS-430/440 series HF transceivers, ostensibly to create a matched layout along with the TS-811A for a complete HF/VHF/UHF station. The final is rated at 25 Watts output (adjustable), and band coverage is from 142–148 MHz to allow MARS and CAP operations. The usual bells and whistles are included, such as programmable memories and scanning, as well as some useful controls such as i-f shift and RIT.

If you read the TS-811A write-up, you'll notice a close resemblance to the TS-711A in layout, performance, and size. Both radios are equipped with Kenwood's Digital Code Squelch (DCS) system, which I did not get a chance to tinker with. This system will not permit the squelch to open on any signal unless the proper "code" is present, functioning in the same manner as Private Line™ (PL), but on a more sophisticated level. In addition, the system can be set up to locate an unused channel and then send another TS-711A equipped with the correct code to that channel—automatically.

The modes of operation included are CW, USB, LSB, and FM, which are switch-selectable from the front panel. An audible CW character signals when the desired mode is selected. Also present is a button marked AUTO, which preselects the mode according to a band plan. You may recall that I found this control somewhat useless on the TS-811A due to the different 70-cm band plan employed in Japan. However, the Japanese 2m band plan is very similiar to that of the U.S., with CW switched in from 144.000–144.099 MHz, USB from 144.100–144.499 MHz, FM from 144.500–145.799 MHz, USB from 145.800–145.999 MHz, and FM again for the remainder of the band.

The rest of the left side controls are AL for priority channel function; SCAN, M.IN for loading memories; LOCK and REV, which lock the main dial and select reverse of any offset present, respectively; and CH.S, which scans memory channels. Tone frequencies for PL can be selected from a switch and the front tuning dial. A 20-dB attenuator is provided for strong signals, and a speech processor (nonadjustable) can also be switched in. In addition to the i-f shift and RIT functions, the right side includes controls for squelch, microphone gain, rf power out, af/rf gain, 1-MHz up/down, and noise blanker (nonadjustable).

Specification	Measured	Claimed
Minimum Discernible Signal	Less than −140 dBm	N/A
Sensitivity (SSB), 10-dB S/N	.20 uV	Less than .16 uV
Sensitivity (FM), 10-dB S/N	.17 uV	Less than .22 uV
Selectivity, SSB		
−6 dB	Greater than 3 kHz	Greater than 2.2 kHz
−60 dB	Less than 7 kHz	Less than 4.8 kHz
Selectivity, FM		
−6 dB	Greater than 5 kHz	Greater than 12 kHz
−60 dB	Less than 20 kHz	Less than 24 kHz
Conversion Gain		
(Rf Amp/Mixer)	19 dB	N/A
1-dB Compression	−1 dB	N/A
Dynamic Range, dBm	122 dBm	N/A
Transmitted Power		
Output @ 50 Ohms	26 Watts	25 Watts
Low Power Output	2.7 Watts	2 Watts
Frequency Accuracy	146.0002 meas.	146.0000 disp.

Table 1. Performance data—TS-711A.

The TS-711A is equipped with two vfo's and a memory bank that can hold up to 40 memories with offsets, subtones, and mode for each channel. Main dial tuning occurs in a range of steps, depending on mode. For example, in FM mode you can either select 10-Hz or 5-kHz steps, while in SSB or CW the choice is—surprise!—10 Hz or 5 kHz. The difference is the button marked CH.Q. When it is engaged, you'll hear a loud "kerchunk" as a solenoid kicks in and the tuning knob "click-steps" in 5-kHz increments, very useful on FM. When it isn't engaged, the tuning is silky smooth. And if 10 Hz isn't fast enough, engage the STEP button and cruise along at 100 kHz per revolution.

As noted before, microphone gain is adjustable from the front panel. Following past Kenwood practice, this applies only in SSB mode. Mike gain is preset on FM and is adjustable only by removing the cover. On other multimode transceivers, such as the IC-275A reviewed last month, the mike gain works in every mode, which I find handy when accessing repeaters with different audio frequency response curves. You know the types—everyone says your audio is too hot, or too low, etc.

The PROC (processor) control is of questionable value on 144 MHz, and I could do without it, especially since the level of compression is not adjustable. On the other hand, RIT is very useful as I have pointed out in the past, especially when you're trying to copy weak CW signals through the noise. And the i-f shift pulls its weight during contests! Its function is very similar to a passband tuning control, shifting the passband of the i-f filter to either side of the desired signal.

Let's now take a look at the schematic. The front end employs a 3SK129 GaAsFET driving a 3SK122 MOSFET mixer, and the combination works reasonably well, as the performance data in Table 1 shows. Selectivitiy is accomplished by the use of two helical preselectors—a two-pole unit ahead of the GaAsFET and a three-pole unit following. This scheme does improve selectivity as shown in the performance data and is the right way to go at VHF and UHF frequencies, especially with broadbanded rf receive amplifier stages. On transmit, an M57727 power module is employed with both temperature and swr protection. ALC control is also afforded, and the ALC level can be displayed via the front-panel meter.

The TS-711A has its own self-contained power supply, and it gets fairly warm with use but never hot. A cooling fan will engage after lengthy transmissions—usually on FM—and disengage when the temperature drops below a certain point. Provision has been made to connect an external supply if you wish to go portable. Other connections can be made for your CW key, headphones, external speaker, and an external standby switch—presumably for a footswitch when in CW mode. There is no front-panel TX/RX switch; I find this a bit of a nuisance, especially when doing performance tests or tuning up amplifiers.

Kenwood has provided one accessory jack for interfacing with RTTY for AFSK operation

(ACC1), and the connections are quite clearly spelled out in the manual. Kenwood also identifies an ACC2 jack in the owner's manual which is intended for a computer interface. However, the knockout on my unit where ACC2 would go was filled by a plastic insert, leading me to conclude that you must buy the optional interface to obtain and use this connection. Either that, or the interface isn't available yet in the U.S. (A third possibility is that this particular unit just didn't have the jack installed!)

In actual use, the TS-711A is quite easy to figure out after you remove it from the box. The human engineering is quite good, although some of the less frequently used bells and whistles could have been pushed off to the side. As in all Kenwood transceivers, provision has been made for dial torque adjustment, but the factory setting was comfortable from the start.

I used the TS-711A with my Microwave Modules MML-220S power amplifier and a Cushcraft 32-19 Boomer, and right away noticed one BIG problem: no external amplifier keying jack. ICOM has been offering these for years on their 2-meter multimodes—so, how about it, Kenwood? I personally can't abide by rf VOX keying and prefer a hard-switched setup. It was no problem switching the Kenwood into transmit through its standby terminal, but I had to use an external sequencer to key both devices.

Receiver sensitivity is adequate, although not on par with many state-of-the-art transverters and the aforementioned IC-275A. On more than one occasion, I had to switch in an external GaAsFET preamp to pull out a weak SSB signal, especially during rapid fading. An outboard preamp would probably be a good idea for very-weak-signal work, but I couldn't recommend anything with more than about 10–12 dB of gain. A preamp exceeding that number will cause the 711A's front end to crunch up on strong signals (as will be shown in the test results).

Selectivity is very good, and I can't imagine too many situations on SSB/CW where you won't be able to pull out some signal from the QRM by using the RIT and i-f shift controls. Incidentally, there are no filter options for the TS-711A—what you buy is what you get. It would have been nice to have some sort of CW filter option at least.

Received audio reports were good, although I noticed a similarity with the TS-430S series HF radios, and that was that most operators preferred the audio of the MC-42 handheld microphone over the MC-50/MC-60 base-station mikes. Reports ranged from "too much bass" to "mushy sounding." The MC-42 was clearly the winner here.

I really wish Kenwood would supply a microphone with their transceivers. Can you imagine how someone feels when they rip into the box, pull out a brand new TS-711A, and discover there's no microphone included? For Pete's sake, mark up the price a few dollars if you have to, but at least include the hand-held microphone!

Performance Review

Now take a look at Table 1. The receiver in the TS-711A got a pretty thorough going-over, as I was looking for dynamic range, compression data, and MDS. The transmitter was checked for power output, output adjustment, and displayed frequency versus measured frequency. The figures are about what I expected, and the 1-dB compression point of −1 dBm is about average for a GaAsFET.

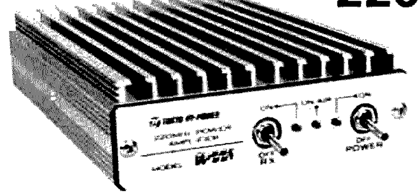
Using an external preamp with the TS-711A might result in IMD products and spurious signals when strong local signals are present, making it very difficult to work weaker signals on nearby frequencies. The dynamic range is acceptable, again considering the use of a GaAsFET in the front end. Selectivity is fairly good. The output power level is sufficient to drive all of the 2-meter amplifiers currently on the market, and the low-power setting is handy for those amateurs using tetrode-type grid-driven power tubes, such as the 4CX250B. I should also mention that operation of the power output control is fairly linear.

Conclusion

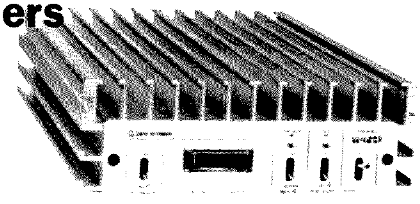
If you would like to add 2 meters to your present station with an all-in-one transceiver, you should consider the TS-711A. In general, it performs as well as any other 2-meter multimode on the market (with few exceptions), is easy to set up and use, and does offer some nice features in addition to the usual complement of bells and whistles. ■

Tokyo Hy-Power Labs HL-22V and HL-102V 220-MHz Power Amplifiers

by Peter H. Putman KT2B



Encomm, Inc.
1506 Capital
Plano TX 75074
Price class: HL-22V $100
HL-102V $300



HL-22V *HL-102V*

With all of the increased interest in 220 MHz nowadays, it's nice to see that more and more of the major Japanese manufacturers are coming out with a wide range of products for the band, including handhelds, mobile radios, and rf amplifiers. This is somewhat unusual when you consider that 220 MHz is strictly a North American allocation. However, Kenwood, ICOM, and Azden recently had their investment in 220 MHz pay off when Novice 220 privileges were approved.

Now we have a new player. Tokyo Hy-Power Labs, a subsidiary of Encomm, Inc., has introduced two rf power amplifiers with built-in receive preamplifiers for 220–225 MHz. The HL-22V is designed to be used solely as a handie-talkie "booster" amplifier in the home or while mobile. It features a GaAsFET preamp and about 20 Watts output for a maximum of 2 Watts drive. The HL-102V can function in a base-station or mobile mode and will provide about 100 Watts output with a maximum of 25 Watts drive.

Out of the Box

The HL-22V housing uses the same extruded polished heat-sink design that THL has become known for. Controls are simple: a power switch and a preamp switch. Three LEDs provide indication of dc power, preamp on, and TX. Rear-panel connections consist of SO-239 connectors for your hand-held and an antenna, plus dc power leads. No provision is made for hard-keying of this amplifier. The unit is extremely small—3-7/8" x 1-3/8" x 5-7/8"—and can be slipped into a glovebox, under your seat, or wherever you want in your car.

The HL-102V housing also has an extruded aluminum heat-sink casing. This amplifier is considerably larger and measures 6-3/4" x 2-3/8" x 10-3/8", which is still small enough to fit under a car seat and of course a home station setup. Front-panel controls include a main power switch, a mode switch (FM/SSB) which sets the dropout delay on rf VOX keying, a preamplifier switch, and a power-level switch which in this particular review model served no apparent useful purpose, as I'll mention later. LEDs display power on, RX preamp on, and TX. In addition, a meter is provided to show power output, but the scale is not very precise other than at the 60-Watt position.

The rear panel of the HL-102V features SO-239 input and output connectors, dc leads, and a four-pin connection for hard-keying on either a PTT ground line or "+" voltage. This is the same connector that Kenwood used to use for touchtone™ pad connections on their old TR-7400A series radios. On both of these amplifiers, the SO-239 connectors are of the single-hole type with a threaded barrel as opposed to the flange-type mounting (such as that used on Mirage amplifiers). I'd also prefer a Teflon™ dielectric in these connectors at this power level and frequency.

Inside

Now, let's look at the lineup of devices. The HL-22V employs one gain stage—a 2SC1946A running at about 10 dB. The RX preamplifier device is a 3SK121 GaAsFET (disk type) and the manufacturer claims about 20 dB gain from this device. The HL-102V employs a pair of 2SC2360 devices with a substantial internal resistive pad that dissipates 12 Watts (otherwise the devices would be overdriven). The RX preamplifier is a 2SK241 MOSFET, and again THL claims about 20 dB of gain in this stage.

On The Air

The HL-102V caused some problems for one of my driving sources, a Microwave Modules MMT 220/28 transverter which really likes to look into a 50-Ohm load most of the time. During on-air use, the transverter would actually go into oscillation even with the keying removed. Even after retuning the transverter, the condition cropped up from time to time, so I suspect that rf leaking back through the dc leads may also have caused some of the problem.

The HL-102V was connected from the MMT 220/28 to a KLM 220-14 yagi using conventional 9913 cable. The power source was an Astron RS-35A, which is more than adequate since the amplifier needs 16 Amperes maximum to work. Current draw on the HL-22V is much lighter at 3.5 Amperes maximum, and it was connected to a 7-element vertically polarized KLM yagi and driven by an ICOM 3AT with standard battery pack.

On-air reports about the HL-102V were satisfactory. No distortion of the SSB signal was reported by any listeners. Since I use hard PTT keying exclusively on VHF, I selected the FM mode for instant dropout to RX. (Note that this switch has nothing at all to do with linearity of the amplifier—just the dropout delay time constant!) I chose also to use the HL-102V as my 220 contest amplifier during the January VHF Sweepstakes and worked a number of interesting grid squares, with contacts as far away as Quebec and upstate New York giving good reports. Fortunately, the rf feedback problem didn't appear this time!

The HL-22V found use as a booster amp

HL-102V

Specification	Measured	Claimed
Preamplifier Gain	10 dB	20 dB
Preamplifier 1-dB Comp.	−6 dB	N/A
Preamplifier 1-dB Gain BW	210–230 MHz	N/A
Max. Transmit Power (Output / Input)	100 W / 25 W	110 W / 25 W
Current Draw	16 Amperes	16 Amperes
Input Vswr	Less than 1.1:1	N/A

Table 1. Performance data for the HL-102V amplifier.

HL-22V

Specification	Measured	Claimed
Preamplifier Gain	14 dB	20 dB
Preamplifier 1-dB Comp.	+5 dB	N/A
Preamplifier 1-dB Gain BW	215–235 MHz	N/A
Max. Transmit Power (Output / Input)	20 W / 2.5 W	20 W / 2 W
Current Draw	3 Amperes	3.5 Amperes
Input Vswr	Less than 1.1:1	N/A

Table 2. Performance data for the HL-22V amplifier.

from the shack for my occasional forays onto local 220 repeaters and 223.50 MHz, and other than reports of increased signal strength, no unusual comments were made by listeners. It's been my observation that most of these small HT booster amplifiers are very reliable and tend to sit quietly in the corner doing what they are told, day in and day out, without a fuss. The HL-22V was no exception as it is truly a set-it-and-forget-it unit to be buried in the car someplace.

Come Here, Igor

Off to the laboratory! The test lab setup was an H-P 608F generator, Boonton 92 millivoltmeter, and Bird 43 wattmeters with 5C, 10C, and 100C slugs. The power source was a Sorensen 20-Amp rack-mount supply, and I used a Bird 600-Watt dry dummy load for transmit tests.

Take a close look at some of the numbers in Tables 1, 2, and 3. First of all, the 1-dB compression point of −6 dB on the HL-102V is terrible. I'm pretty surprised at this, considering the design, and must conclude that the particular device used in this amplifier must have been a fallout! A well-designed preamp ought to have a compression point close to 0 dB or better. Happily, the numbers are much better on the HL-22V with a +5-dB compression point, and this preamp offers good performance with 14 dB of clean gain.

Both units are reasonably broadbanded on receive and on transmit. The HL-22V runs somewhere between 9 and 10 dB of gain on transmit, while the HL-102V is cooking along at about 7 to 8 dB, and the variance in the latter amplifier is no doubt due to the nonlinearity of the input resistive pad at different power levels. I was able to get about 25 Watts out of the HL-22V, but it took over 3 Watts to do it, so consider it saturated at 2.5 Watts drive. Under no circumstances could I get more than 100 Watts out of the HL-102V, even with 30 Watts of drive, so it definitely saturates at about the 25-Watt input level.

Now, to get to that HI/LO power-level switch. According to the owner's manual, this switch drops the output to about half in normal service. In actual service, however, with 20 Watts of drive applied, flipping this switch to LO resulted in the power output dropping from 90 Watts to 32 Watts. With 15 Watts of drive, the output fell from about 75 Watts to 22 Watts. This, in effect, cuts the gain to about 1.5 dB and essentially takes the amp out of the line! I suspect that the resistive pad that is switched in here is too large, and a value should be recalculated to drop the output by perhaps 3 dB instead of almost 6 dB.

With the proper size pad, you would then be able to run, say, 100 or 50 Watts out for 25 Watts of drive, and 60 or 30 Watts out for 10 Watts of drive. This might be useful if you intend to employ a grounded-grid amplifier such as the 8874 or 8877 type, as these would result in output level variations from 400 to 1,000 Watts with such an amplifier. This, of course, would result in less overall dc power consumption from your outboard supply, which could be handy at times.

The heat sinks in both amplifiers are adequate; the HL-22V more so. Sustained contest operation on CW and SSB resulted in the case of the HL-102V getting quite warm but not unbearably hot to the touch. It does not appear from the schematic that either amplifier incorporates any form of overtemperature protection, so be sure to allow sufficient ventilation wherever you install them—a good idea anyway. I'd like to mention also that THL has used a high-quality 50-Ohm Tohtsu coaxial relay in the HL-102V, unlike some manufacturers who insist on using dc-type relays to save a few bucks. It's worth the extra money at 220 MHz and above—believe me.

HL-22V	HL-102V
0.3 / 1	1 / 6
0.5 / 3	3 / 20
1 / 9	5 / 36
1.5 / 15	10 / 60
2 / 18	15 / 76
2.5 / 20	25 / 100

Table 3. Transmit linearity (Input / Output) measured at 223.50 MHz.

Conclusion

If you are looking for an alternative to the limited supply of 220-MHz amplifiers, the HL-22V or HL-102V might be for you. Both are rugged units that fill the 20-Watt and 100-Watt gaps nicely. The preamplifier in the HL-22V works exceptionally well and is ideal for a high-density rf environment. The HL-102V preamplifier didn't make the grade, but I have to believe the unit I tested was just plain defective. (It's something you may wish to follow up on with Encomm if you are considering the purchase of this amplifier.) For more information on Tokyo Hy-Power amplifiers, circle number 201 on your Reader Service card. ■

OPTOelectronics 1300 H Frequency Counter
Wenzel Associates Counter-Mate Frequency Standard

by Peter H. Putman KT2B

OPTOelectronics, Inc.
5821 N.E. 14th Avenue
Ft. Lauderdale FL 33334
Price class: $150

Wenzel Associates, Inc.
11124 Jollyville Road
Austin TX 78759
Price class: $350

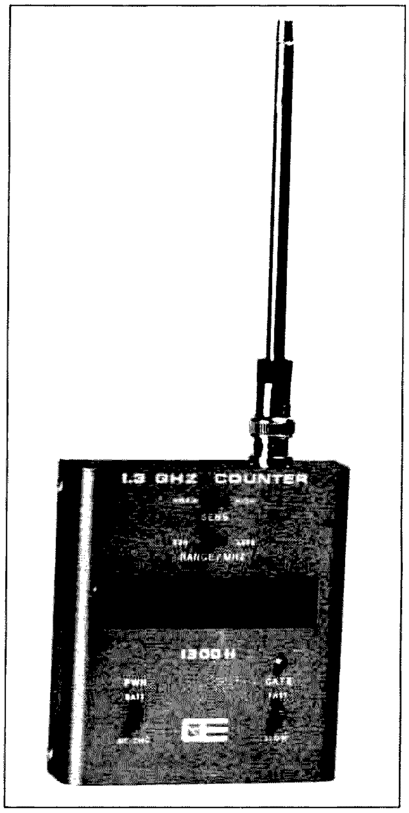


Photo A. OPTOelectronics' 1300 H hand-held frequency counter.

Here are a couple of interesting products you may find of use around your shack. The first, OPTOelectronics' 1300 H hand-held frequency counter, would be of interest to the VHF/UHF enthusiast, as it covers up to 1300 MHz with two sensitivity ranges and a whip antenna. The second, Wenzel Associates' Counter-Mate Frequency Standard, is an oven-regulated, crystal-controlled source of rf at 1 and 10 MHz with external dc supply.

1300 H

The 1300 H counter is small. With dimensions of 4" x 3.5" x 1", this unit was intended to be used in the field to make quick frequency checks, but it also serves well in the laboratory. (An accessory carrying case is available, but there's no hole for the accessory whip antenna should you wish to use the counter in inclement weather.) The 1300 H is actually the top-of-the-line product in a range of portable counter models, including the 1200 HKC (1200 MHz, kit form) and 1200 HC (1200 MHz, wired), and runs off rechargeable NiCds or the included ac power supply/charger.

The whip antenna is an option, as is a 50-Ohm terminated probe. Both sell for less than $20 each, so if you plan to do a lot of measurements in the lab, I'd spring for the pair. OPTOelectronics claims "excellent sensitivity" for these units, with levels of 3–50 mV from 10–1000 MHz being typical. I decided to check for myself using a signal generator and came up with the numbers in Table 1.

It's apparent that the greatest use of the 1300 H is from about 50 MHz to 400 MHz, for

Measured Frequency	LO Sensitivity	HI Sensitivity
10 MHz	−23 dBm	−23 dBm
30 MHz	−28 dBm	−29 dBm
50 MHz	−32 dBm	−37 dBm
100 MHz	−36 dBm	−39 dBm
150 MHz	−34 dBm	−40 dBm
200 MHz	−31 dBm	−44 dBm
250 MHz	−28 dBm	−40 dBm
300 MHz	−26 dBm	−41 dBm
350 MHz	−24 dBm	−38 dBm
400 MHz	−21 dBm	−31 dBm
450 MHz	−17 dBm	−25 dBm
902 MHz*	−6 dBm	−6 dBm
1296 MHz*	+6 dBm	+2 dBm

*These measurements were made using an HP-608F generator and a Boonton 92 rf millivoltmeter—except at 902 and 1296 MHz, where precision QRP wattmeters and attenuators were used.

Table 1. OPTOelectronics 1300 H counter measured sensitivity.

after this point the sensitivity drops off rapidly. For reference, a level of −25 dBm is 9 millivolts and −40 dBm is 2 millivolts. Sensitivity at 902 and 1296 MHz falls off so much that you will have to use a source of rf at better than 100 millivolts to get a reading to lock up. This still would allow measurement of low-level mixer and oscillator stages running in the high microwatt range, and, of course, hand-held radios and transverters can also be tested with ease.

There are two selectable gate times—.25 seconds and 2.5 seconds—that allow resolution to 1 kHz and 100 Hz, respectively. OPTOelectronics claims accuracy to be about ±1 ppm (±.00001%). As I couldn't verify this claim without a very accurate VHF frequency standard, I'll have to take their word for it. The display is an eight-digit, red LED-type with decimal-point indication at the MHz mark.

Counter-Mate

The Wenzel Associates Counter-Mate Standard is claimed to be very accurate, but I couldn't use it with the 1300 H since it generates a 5-V-rms square wave at 1 and 10 MHz. The 1300 H read this 10-MHz signal at either 20 or 30 MHz depending on the mood it was in, and this isn't surprising considering that a square-wave signal of this nature will be rich in harmonics. It does make the Counter-Mate a very strong 1-MHz marker generator!

The Counter-Mate contains a sophisticated scheme using a third-overtone, 10-MHz crystal in an insulated copper oven. This oven in turn is maintained at a high temperature to minimize ambient temperature effects, and a precision 50-turn trimmer can be accessed for recalibration. (Wenzel strongly suggests that you have them do the calibration and the determination of your aging rate between calibrations.) Frequency-divider chips provide the square-wave outputs suitable for TTL or 50-Ohm systems. In addition, external power splitters can be used with multiple counters. (With 5 volts rms, that's plenty of output for multiple counters!)

I was able to connect the Counter-Mate to the 10-MHz input on my Ramsey Electronics 600-MHz counter. In fact, I'd probably leave it connected most of the time as a standard on a scope as well. Wenzel Associates claims the aging to be less than .03 ppm/month after one week of operation, so it is certainly more stable than, say, the 1300 H counter, which ages at the rate of .1 ppm/month. You'd expect that kind of stability with a proportional oven, however. Retrace (the ability to come up to the same displayed output again and again after power-up cycles) is rated within .01 ppm of the previous frequency after 60 minutes, based on a 24-hour downtime.

This means that if you plan some very precise measurements, turn the unit on about an hour before you plan to start. Indicators on the front panel display power ON and READY (when the oven has reached its correct operating temperature—not when the crystal has stabilized). If you plan to use the 1-MHz output as a calibration source for HF radios, use a large attenuator, say, 10 dB; otherwise, you may overload the front end. The harmonics are strong enough right up through 50 MHz for precise calibration work.

Conclusion

Both the 1300 H and the Counter-Mate are useful additions to the shack, especially the former unit, which lends itself nicely to field-testing of all kinds of VHF radio equipment. The latter unit would find more use with those engaged in precision measurements, but it's kind of nice to have such a standard if you use frequency counters or oscilloscopes in your station.

Reader Service numbers: OPTOelectronics, 202; Wenzel Associates, 203. ■

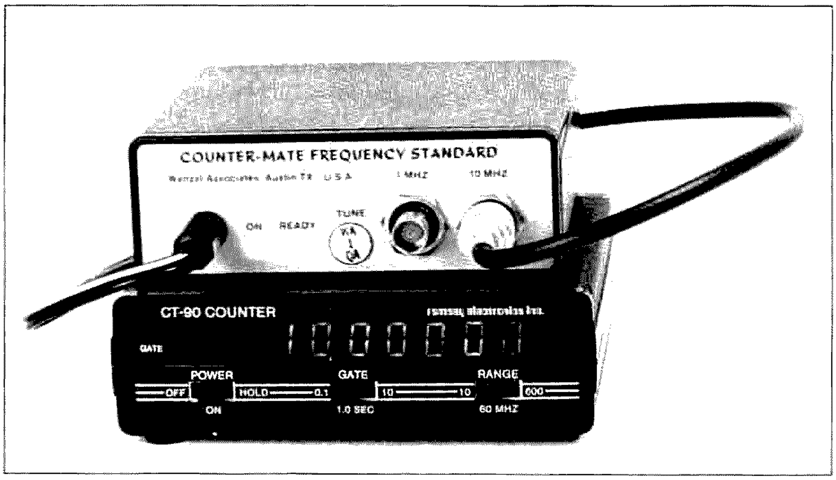


Photo B. Wenzel Associates Counter-Mate frequency standard (top) hooked up to a Ramsey frequency counter.

Heath HW-99 Transceiver

by Errol Naimon KA9HCC and Patty Naimon KN2F

Heath Company
Dept. 011-442
Benton Harbor MI 49022
Price class: $300

Enter Heath's latest Novice transceiver, the HW-99, complete with an integral power supply and a solid 50 Watts on 10, 15, 40, and 80 meters. The rig is solid state and ruggedly designed, and should see years of trouble-free service. The minimal controls will simplify life for the Novice, but will utterly frustrate just about anyone else.

The front-panel controls consist of a power on/off rocker switch, a four-position rotary band switch, a large tuning dial, a volume adjust for output to speaker/phones, and a level adjust which varies the drive to the transmit amplifier chain. The level control is functional only up to the nominal 50-W output limit, provided that output vswr is low; otherwise, an automatic-level-control (ALC) circuit derived from a directional coupler at the output of the transmitter overrides the front-panel level control and cuts back the transmit drive.

A 10-segment LED bar graph is used to display receive signal strength relative to a no-antenna (all segments off) condition. In the receive mode, the display source is the agc detector tapped off the i-f amp. In transmit, the display is driven by a relative power amp which obtains a voltage from the ALC pickup, the directional coupler. No tuning controls are provided since the PA is a broadbanded linear and no tuning is necessary.

The forward and reflected components are summed at the output of the coupler. If either forward or reflected power (or both) increases, so does the display indication; hence, a greater number of lights on the display does not necessarily mean more power out. Operating into a high vswr load can easily light up the whole bar graph, giving the illusion of higher power output even though little or none is actually getting out.

The transceiver is executed on three single-sided boards: an oscillator board, a transmit/receive (T-R) board, and a power-amplifier (PA) board. Single-sided boards for rf kits have characteristics worthy of note for the uninitiated. On the plus side, they are less costly. The components are usually more spread out (i.e., less dense) than double-sided or multilayered boards to make room for more routes, since almost all of the tracks must be crammed into a single layer.

This allows for simpler kit building and troubleshooting. Most of the components are easily accessible, and the chances of shorting something while poking about are reduced since those pesky traces and pads are hidden on the less-accessible underside of the board.

On the other hand, since the traces are all on one side, they necessarily are arranged more densely even though the components are more spread out. Inevitably this means that many traces and pads at substantially different dc levels will end up adjacent to each other, increasing the probability of a catastrophic solder bridge during construction. Equally detrimental is the loss of a ground plane which would improve amplifier stability and harmonic suppression by providing an ultra-low impedance/inductance return for supply current as well as an effective shield.

Building the Kit

Construction of the kit is straightforward although not necessarily simple. Take the time to familiarize yourself with the instructions. No fewer than 10 (count 'em . . . 10!) double-sided pages of instruction-manual changes are included. To avert disaster, read over the changes carefully and enter them all in the manual. Don't delude yourself into thinking that just by having the errata handy you will catch all of the goofs . . . you won't! And do this *before* beginning construction, not as you go along.

The time estimate for completion of the kit as given by Heath is 16 hours. It took me about twice that to complete the job, and a good deal more time to track down the ouches.

Oscillator Board

This is the largest board and the simplest to construct. I recommend that L218 be installed before capacitors C269 and C271–C274 to make it easier to push L218 lugs into the board.

T-R Board

This is somewhat smaller than the oscillator board, but it is more densely arranged and contains a number of hand-wound transformers and inductors which no doubt will prove challenging to the novice kit builder. Carefully note the position of the color dots and notches on rotary switch SW101 in the instruction manual *changes* or you will be lost in space later. Expect a battle from D123 and D124 as the leads are just barely small enough to be inserted into their designated circuit-board holes.

Before building this board, check for a foil-to-foil short to ground at the junction of C134 and C137 (about the middle of the board). My board *was* shorted there after construction. I thought it was a solder bridge, but after removing all of the components in that section and meticulously cleaning all the solder off that part of the board, it still showed a dead short. A trusty X-acto® knife made "short" work of the problem.

PA Board

The power amp board is the smallest but not the least challenging. Several hand-wound transformers make construction interesting. A special word of caution concerning the broadband output transformer T304: Bare wires are soldered to printed-circuit-board (PCB) pieces to serve as leads to connect the transformer to the PA board. Make sure that no part of these wires protrudes over the top of transformer PCB ends, since there is almost no clearance between the transformer and the PA shield. A sharp edge of a wire will easily penetrate the paper insulator on the PA shield and potentially short the 30-V supply to ground. You may wish to check up on that situation with an ohmmeter following installation of the PA board.

The Chassis

The ac wiring, 12-V supply, controls, and input/output jacks are all chassis mounted. Exclusive of the 12-V regulator (U1), the entire 12-V supply is mounted on a 7-lug terminal strip. With board-to-board interconnects here as well, this lug strip gets to be pretty busy, and, if difficulty arises, it is not easy to repair. Circuit-board mounting of this section would simplify life greatly.

A word of caution: Configured as it is, U1 is not blow-out proof. Output capacitor C12 (100 uF) has ample energy storage to destroy U1 should the *input* to U1 become shorted to ground. The schematic is somewhat deceptive at the 12-V supply. Circuit board ground and chassis ground are shown as isolated. In fact, they are made common in at least two places here: first at the center tap of T1's secondary (the red/yellow wire) and the tab of 3-terminal regulator U1.

The board-to-board interconnects are molex® terminals and are time-consuming to crimp without the proper tool.

Finally, the headphone jack is a mono jack. If you have stereo phones (who doesn't?) and don't fancy listening with just one ear, you either will need a mono/stereo adapter or you will need to replace J1 with a stereo phone jack and tie P206-1 (center conductor) to both left and right channel phone lugs.

Alignment

Following repair of all the boo-boos, alignment was a snap. Goofs: two diodes incorrectly inserted; three board shorts (two ours, one theirs); SW101 installed correctly, but shaft notch 180° reversed (see previous comments concerning instruction manual changes); bad

C246; L210 up in a glorious puff of smoke; and J1 soldered incorrectly (don't rely on the pictorial, 4-8, as it does not clearly show the lug hook-ups; you must rely on the schematic).

However, the manual calls for equipment that the average Novice probably doesn't have: a 10-MHz frequency counter and an rf wattmeter capable of measuring 75 Watts. Finding C246 bad would have been difficult without a scope, since rf voltages at the hfo are pretty low and would scarcely show up on the built-in rf detector. A 50-MHz scope came in handy here showing a beautiful low-level sine wave (on all bands) at the hfo side of C246, but only dc present at the hfo buffer side.

It may be of interest to note that resistance readings given in the manual were obtained using a Heath IM-5218 VTVM. The manual notes that readings taken with other ohmmeters (because of different measuring voltages and currents) may be considerably different. We found this to be true.

Don't rely on your Heathkit® store for replacement parts. I promptly ordered (paid up front) a list of all necessary replacement parts as none were in stock. I was told that a two-week lead time was typical. I then ordered the same (equivalent) replacement parts from the will-call desk of a local electronics wholesaler and subsequently picked up the parts three days later. It has been two months, and I haven't heard from Heathkit yet.

One disquieting feature I noted during alignment of the vfo and in subsequent operation thereafter was the lack of a positive end stop on the tuning vernier. The mechanical end stop is supposed to be created by the end of a semi-circular groove on the tuning dial within which ride two screw heads contained in the vernier assembly. It is difficult to tighten the vernier assembly sufficiently on the tuning dial to prevent the dial from slipping as pressure is exerted against the stop. This knocks the vfo out of calibration and puts you off frequency. Because you are on the easy end of a gear reduction, you may not even notice that an end stop has been encountered, and you will be merrily knocking your rig out of calibration repeatedly.

Operation

For a Novice sitting down to use a transceiver for the first time, the HW-99 would be one of the least intimidating radios to operate. With such a simple and uncomplicated front panel, there isn't much to adjust or misadjust. Heathkit understood the obvious inexperience and jitters that go along with those early QSOs. This basic rig will help the Novice to gain confidence as s/he enjoys those first contacts.

However, as the new ham gains experience, the realization will come that there are some features that Heath could have included that wouldn't have complicated the front panel too much. We've already discussed how easy it is to change the vfo alignment by dialing the tuning vernier past the end stop. A crystal calibrator would come in handy to help the operator maintain correct alignment or at least know how far off the dial is. It's always better to be sure of your frequency rather than to guess if your dial reading is accurate. As you gain new operating privileges by upgrading to a General-class license or higher, it will become more apparent that the dial may be 10–15 kHz off at one band edge—and the FCC frowns upon people who operate where they don't have privileges.

Another complaint is the lack of a meaningful meter. The 10-segment LED bar graph looks impressive (all those tiny red lights), but can be giving you misleading information. The manual cautions you to never turn the level control past a point where more than eight segments are lit. It explains that if you do, rf power output will not increase because the ALC circuit will automatically reduce the carrier level from the transmitter.

We checked this with a Bird 4410A wattmeter. The ALC worked as it should, but not at the indicated number of LED segments lit. For example, on 80 meters with seven segments lit, we measured 42 Watts output. We increased to 10 segments lit and obtained a peak power output reading of 58 Watts. As we continued to turn the level control, 10 segments remained lit and the power did cut back as it was designed to do.

On 15m, 40m, and 80m, the power peaked at 10 LED segments lit. On 10m, four segments lit was the maximum that would light and was the maximum power output. The maximum forward power we measured on each band was: 10m, 42 W; 15m, 71 W; 40m, 62 W; and 80m, 58 W. We also found the level control to be very touchy. It didn't take much of a turn to dramatically increase/decrease power output.

The tuning dial is marked in 5-kHz increments and numbers indicating frequencies are every 50 kHz. Markings every 1 kHz and numbers every 10 kHz would have been nice.

One problem that I've encountered has to do with the volume control. For most QSOs, it's fine. But when you're listening to a strong signal, it doesn't turn down far enough. More than once, I've been blasted out of my headphones because of this. (Or, if you're using the speaker, the sleeping kids could get blasted out of their beds.)

Being a radio designed for the Novice, it doesn't have 20m, nor does it have the WARC bands. Adding the capability of having those bands would have necessitated extra circuitry (obviously) and may have meant using double-sided circuit boards. Since the object of this radio was to give the Novice a good start in amateur radio, to keep the kit building as easy as it could be, and to keep the price down, it probably isn't reasonable to expect it to include the other amateur HF bands. Nor is it reasonable to expect lots of other features that are found on more expensive HF rigs. This is a good, basic HF transceiver.

Conclusion

Using the HW-99 was fun. The receiver was clean sounding and sensitive. Most of the comments I received about the transmitter were good. Some of them were "Rig sounds great," "Doing a good job," "You can be proud of it," "Sounds FB to me," and "Very good."

On the whole, the rig is a well-conceived, straightforward piece of work. An experienced builder will not be at all intimidated by it. The first-time builder probably will be. In use, with a good antenna, the rig performs admirably with minimal fiddling, no doubt much as the designers at Heathkit had imagined. The lack of adjustment and meaningful information about power output or state of tune given by the rig are its biggest flaws.

For more information about the Heath HW-99 transceiver, circle number 206 on your Reader Service card.■

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Dayton Digest

Put over 20,000 hams in one place at one time and what do you have? Come on along and find out.

There's just no getting around the fact that the Dayton, Ohio, Hamvention is a people event—for the people, with a crowd of more than 22,000 anticipated for the April 24–26 event, and by the people, with more than 300 volunteers on 31 standing committees to organize the event.

If you'd like to learn more about the 36th annual Hamvention—and perhaps be a part of the event amateurs around the world call "the center of the ham radio universe"—then take a few minutes to read this article. I'll show you how to turn your dream of attending the 1987 Hamvention into a reality!

"If you see a forum that you'd like to attend, give it priority because the forums come only once, while the buying and selling will be going on all weekend."

The Old and the New

Each year, I find the Dayton Hamvention to be a more interesting mixture of what's old and new in amateur radio and in consumer and commercial electronics. With some exceptions, the old can be found by browsing through the Hamvention flea market (which for 1987 is expected to hold more than 1,500 spaces), while the new will be residing inside the host structure, Dayton's Hara Arena. Here, 200 to 250 spaces are set aside for major exhibitors and their state-of-the-art products.

Whether you like the old or the new or a mixture of both, you'll get your chance to see and touch it all during 2-1/2-day run of the Hamvention.

Of course, there's more to the Dayton affair than just buying and exchanging equipment. Each year, the Hamvention offers a variety of activities including the banquet, forums on most ham radio topics (more than 40 in 1986), talks by the world's most famous and knowledgeable hams, FCC examinations, prizes, alternative activities, CW proficiency tests, and much more during the Hamvention weekend. You can see why hams who make only one hamfest a year travel to Dayton, the granddaddy of them all!

Photo A. The gates open and the crowd comes flooding in.

Planning Your Trip

I guess the first step on the road to Dayton is obvious—get with the gang and see who wants to go. To help them make up their minds, let them read this article and have someone who has attended a recent Hamvention come and talk about the experience. The ones who favor making the trip probably will have to arrange for time off from work if travel days are needed.

To help you stay within a budget, plan early and order your room reservations through Hamvention Housing, 1980 Kettering Tower, Dayton OH 45401-1980. Most area hotels and motels offer a special rate for guests during the Hamvention. Although no reservations are taken by telephone, you can get information about room rates and locations by calling Hamvention Housing at (513)-223-2612.

Covering Expenses

The average ham has most of his extra cash invested in his station, so here's a suggestion that could help defray the cost of your sojourn to Dayton.

The best way to raise funds at the Hamvention is to order a flea market space and sell some of your extra equipment. There are other advantages to having a flea market space. Having a piece of real estate at Dayton gives you a selling point as you gather your group together for the trip—they can sell their surplus also, and the space provides a focal point at which members of your group can gather between market raids and other events.

The charge for a flea market space has increased from $20 to $23; by dividing the cost among the members of your group, it is an expense easy to bear.

If the time required to man the booth is divided among the group members, each person gets the time to see the entire Hamvention.

Persons holding flea market permits and registration tickets can enter the flea market beginning at 8 a.m., Thursday, April 23, to set up in their numbered, assigned space(s). Selling officially begins with the opening of the flea market at noon, Friday, April 24.

Unfortunately, by this time of year all flea market spaces have been sold out for months–they're usually snapped up in the first couple weeks of availability. No secondary selling of flea market permits is allowed, so if you want to go this route, start working on some major advance planning for Hamvention '88.

If you have any other questions about the flea market, you can call the special Flea Market Hotline at (513)-223-0923. This phone is in the home of Flea Market Chairman John Grody WB8TEK and his wife, Cathy, so make your calls before 10 p.m. Eastern Time.

What You'll See

Now that you've bought your tickets, it's only fair that I tell you a little about what you'll see at Dayton.

The first thing you'll notice is the crowd. Don't worry—the Hamvention organizers have prepared for this turnout, and it shouldn't inconvenience you unless you try to buy lunch precisely at noon or opt to get a free cap given away by one of the generous dealers. Here, the obvious tip is to eat lunch before or after the lunch hour to avoid wasting time standing in a long line.

And it is important to save time at Dayton if you are going to see all of the new amateur gear and take mental notes on the incredibly low prices.

For the last few years, I've been able to watch the price of 5-1/4" floppy disks fall to the bargain level, in 1986, of $6 for 10. This special was available on the first day, but after the dealers ran out, the bargain was gone. So keep in mind that bargains at Dayton don't stay around too long and when the price is low and the expected demand is high, the opportunity will be as limited as the available stock.

Keep in mind that handie-talkies are one of the hottest items sold at Dayton. If you see the one you've been yearning for at an acceptable price, ask the dealer how many he brought to the Hamvention and respond accordingly. Simply put, if he brought two and you want one, you'd best buy it now.

Other items can be handled differently. Say you're looking for a new low-band rig and you want to get the best price possible. Well, this is a big-ticket item and how new it is can affect how many the dealer brought with him. As a rule, the more expensive the item, the better chance you have of it being around on Sunday—the last day of the Hamvention.

So Sunday is the best day for getting a dealer's best price. Buy then (or try to get the dealer's Sunday price on Friday or Saturday), but don't forget to shop that price around the various dealers and see how they respond. After all, this is business and your goal is to get the best product for the best price. That's what they advertise, so make sure that's what they deliver to you.

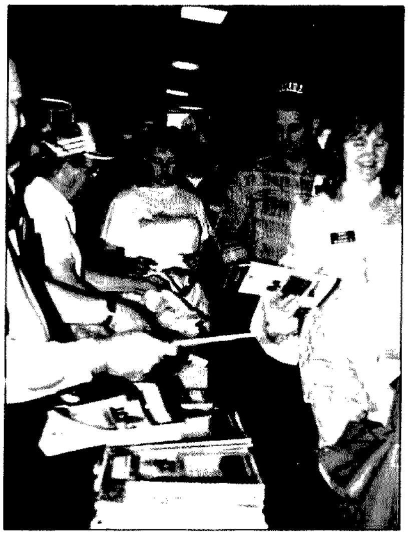

Photo B. You can't tell the players without a program.

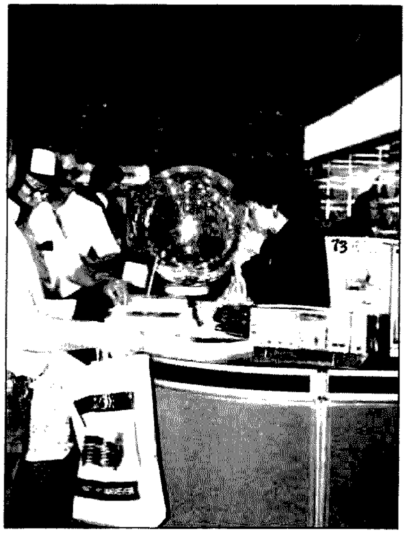

Photo C. The big manufacturers strut their stuff.

Along with the dealers inside the arena, you'll also find a large selection of manufacturers who make use of the Hamvention to market their products and visit their dealers. They also are there to answer any questions you might have about their products, so if you are genuinely interested in purchasing, feel free to pick their brains.

This brings up another unique opportunity that presents itself only at Dayton. The chances are good that the person you're questioning about a product is a person who invented or developed it, not just a trained marketing representative. Brother, that's the best source for product information you'll ever have, and Dayton is where you'll find it!

The Weather

For the last three years, the Hamvention has enjoyed some of the best weather imaginable. Clear skies and warm temperatures have blessed the Hamvention and have lulled some attendees into a false sense of security, thinking that rain on Hamvention weekend is an impossibility.

Unfortunately, that's not the way the cold front crumbles. I've enjoyed the beautiful weather, but I've also kept a heavy coat handy for the cold temps and precipitation I've seen that can empty the flea market and

Photo D. Chet Lambert W4WDR personally makes over 10,000 friends at each Hamvention.

Photo E. Ahhh, the flea market. Four people look on as one man decides if he can afford to spend $1.25.

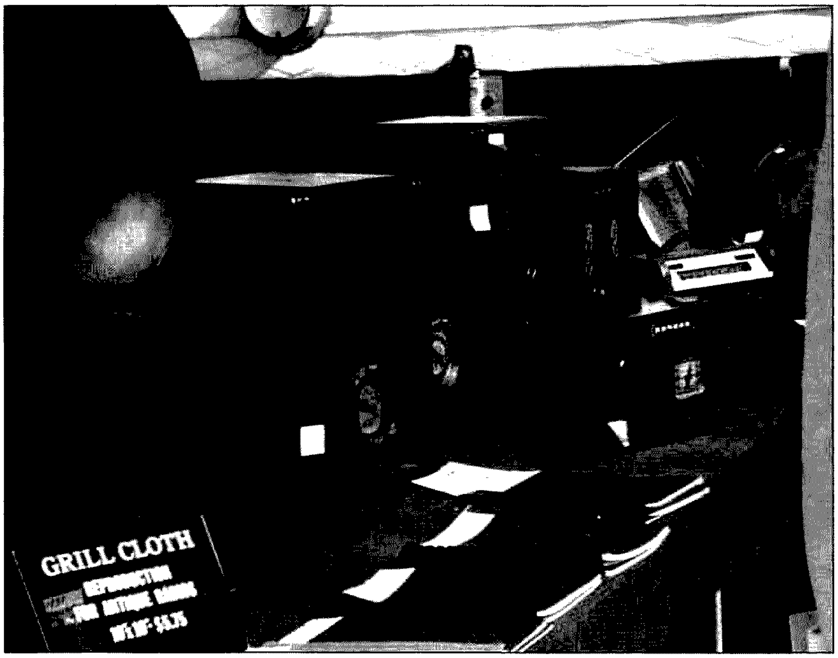

Photo F. "Yes, ladies and gentlemen, these are absolutely the latest in technology, just off the boat from Japan."

GENERAL INFORMATION

Hamvention Information—(513)-443-7720.
Flea Market Hotline—(513)-223-0923.
Housing Information—(513)-223-2612.
Flea Market Setup Day—April 23. Registration tickets and flea market permits must be shown together to gain admission to the flea market prior to opening.
Prices—Registration tickets are $8 in advance, $10 at the door; flea market spaces are $23; banquet tickets are $15 in advance, $17 at the door (*if available*).

CHECKLIST

- ☐Get the group together, see who wants to go, then figure on how many vehicles you'll need to make the trip.
- ☐Talk to the boss to arrange for the appropriate days off from work.
- ☐Secure room reservations for necessary nights.
- ☐Order registration tickets and flea market permits.
- ☐Save your money and gather the items you plan to sell at your flea market space(s). Bring twice as much money as you think you'll need. Be sure to convert cash to traveller's checks for your safety and convenience. Don't expect sellers to accept personal checks.
- ☐Make and carry a list of things you want to buy at the Hamvention.
- ☐Hit the road.

turn the inside of Hara Arena into an elbow-flattening crowd.

In a word, the weather at Dayton is changeable. So check your forecasts before departure, pack for the unexpected, and dress in layers like the outdoorsman so you can take off or put on clothing as the weather changes. Top off the layers with a waterproof jacket in case of rain or snow. (Yes, it does occasionally snow in Dayton in April; I've seen it.)

Arrival Time

You've done all of the planning and finally the big day is here and you are in the city of the Wright Brothers, Dayton, Ohio. What should you do first? A little orientation trip might be useful, so head for Hara Arena. Don't know how? Motor down I-75 to Needmore Road and exit west; turn right on North Main, then left on Shiloh Springs Road, and watch for Hara Arena to be on your right. Look around, locate the gates to the parking area and to the flea market, and go see where your flea market space is located.

Next, it might be a good idea to check into your motel room and, depending on the time, grab a meal or tour one of Dayton's two leading attractions—the Air Force Museum at Wright-Patterson Field (10 minutes from downtown Dayton) or the Dayton Museum of Natural History (home of the Dayton Amateur Radio Association Club station, W8BI).

Whatever you do on Thursday night, try to get a good night's sleep; you'll need all the rest you can get to survive the first day of the Hamvention! Opening time is noon, but you'll need to be there early to set up your flea market wares and maybe check out what your fellow flea-marketeers have brought to sell. Buying and selling is prohibited until the flea market opens, but it's great to spot the bargains so that you can come back and buy them later.

Once the Hamvention opens, enter the inside exhibits through the main doors of the Silver Arena and you'll receive a free copy of the Hamvention program which contains a complete listing of activities, including forums. Take a few minutes to look over the schedule, and if you see a forum that you'd like to attend, give it priority because the forums come only once, while the buying and selling will be going on all weekend. Closing time on Friday is 6 p.m.

On Saturday, the flea market opens at 6 a.m., while the inside exhibits open at 8 a.m. Both close at 5 p.m. to give all persons who plan to attend the banquet time to change and drive downtown to the Dayton Convention Center.

Speaking of the banquet, if you miss it you're missing a big part of the Hamvention. In 1986, Roy Neal K6DUE was presented the Amateur of the Year Award—just one of the awards presented at the annual event. We not only enjoyed watching the award presentations, listening to featured speaker Roy Neal, and eating a great meal, we also had a chance to get Senator John Glenn's autograph when he stopped by to congratulate his friend, Roy. That was an unexpected pleasure—but it was one of those lucky things that happen at Dayton.

On Sunday, the flea market opens as on Saturday, at 6 a.m., and the inside exhibits at 8 a.m., but the level of activity slows as the time nears for the drawing for unclaimed hourly prizes at 2 p.m. and the drawing for major prizes at 3 p.m. In 1986, the major prizes included a complete Kenwood TS-940S station, and ICOM IC-751A HF transceiver, a Yaesu FT-1 HF transceiver, and a Shackmaster 100 Station Controller—so if you feel as if you're due to win a prize, stick around!

Additional Activities

If I tried to write about all of the activities held in association with the Dayton Hamvention, I'd need all of the space in the magazine. But be aware that there are many alternative activities planned in a variety of interest areas.

Now that you know how to do it, let me give you a formal invitation to join me at the 36th annual Dayton Hamvention, April 24, 25, and 26, 1987. Get the gang together and come on along. You should have a most enjoyable time at "the center of the amateur radio universe." See you there! ■

William R. Stocking WØVM
Silent Key

QRP Antenna Farming

Your antenna can be the single most important factor in QRP success—WØVM plants the seeds for more efficient operation.

Nearly everything that has been written about QRP operation points out the need for having excellent antennas. For best results, a QRP "antenna farm" should have two or more antenna systems, and the operator should be able to switch from one antenna to any one of the others instantly. It is rather useless to dream about farms up on high hills with long-wire antennas supported by poles 100 feet tall and a rotating beam on top of a 100-foot-tall tower. Most amateurs have to make do with the space they have.

My friend Harry once lived in a small house on a very small lot. When asked about his antenna farm at that location, Harry wrote, "Over the years, I wore out the roof putting up and changing antennas. But the main antenna that got me WAC (Worked All Continents) was the vertical J on 20 meters—with 100 Watts maximum power. The antenna didn't 'do' much until I added the extra height so that the bottom of the 33-foot radiating portion was above the power lines going down the alley. Incidentally, those power lines were just 1/2 wavelength away from the 20-meter antenna. That last bit of height cleared the way for some good results. Press the key and they came back quite well."

Harry had to go up quite high to get good results. "There is no substitute for height" is one of his favorite and most repeated sayings. In front of Harry's house is a large tree. A wire 99 feet long runs from the shack up into the tree and out to the pole on the back of the house on which the vertical J antenna is mounted. The top of the pole is 52 feet above the ground. Another wire, 33 feet long, runs from the shack horizontally along the side of the house.

The transmitter's output is inductively coupled to a coil. One end of this coil is connected to the end of the 99-foot wire, and the other end is connected to one side of a large variable capacitor. The other side of the capacitor is connected to the shack end of the 33-foot wire that runs along the side of the house. With this arrangement, the antenna system can be tuned to resonance at any frequency in either the 40- or 80-meter band. Harry wrote, "This antenna was good for all U.S. coverage and all of Canada. Again, 100 Watts maximum dc input to the final stage."

Harry's small antenna farm proves several things: (1) It is important for an antenna to be up high and in the clear; (2) an antenna system should be tuned to resonance on the exact frequency being used; (3) good results can be obtained even if the area available for antenna construction is small; (4) the low angles of radiation provided by a vertical half-wavelength antenna help in working DX stations; and (5) it is a good idea to experiment with many different antenna systems until you have one that performs well.

> ***"Antennas for QRP operation should have gain as compared to a half-wavelength dipole for the frequency in use."***

Making Do With Space

If you have little space for antennas except straight up, you will be interested in designing good multiband vertical antenna systems and mounting them way up in the air, as high as possible. With more space, you could plan and build a better antenna farm, possibly using a multiband antenna that would work on 80, 40, and 30 meters and on the higher-frequency bands as well. You could also have a rotating beam antenna for 20, 15, and possibly 10 meters. (Someday, 10 meters will again be usable. Hi!) A tuned-doublet or center-fed-zepp antenna system would be ideal for use on 80, 40, and 30 meters.[3] For best results on 80 meters, the wires should be at least 66 feet each side of the tuned feeders.

If you don't have the space for 66 feet of wire each side of center, shorter lengths will work quite well so long as the length each side of the center is exactly the same. Also, in some cases, the ends of the 66-foot-long wires could be bent around and strung up at an angle to the rest of the wire.

So that the antenna system will work well on 80 meters, it is a good idea to make the wire lengths at least 35 feet each side of the center. In most parts of the United States, antenna wires running north and south are desirable so you can send best east and west. This north/south-running 80-meter tuned doublet, when used on the 20- and 15-meter bands, would have strong lobes extending northeast, northwest, southeast, and southwest.

With this kind of antenna located in St. Louis County, Missouri, I have made good contacts in Europe and eastern Asia on 20- and 15-meter CW. I have also made 40- and 15-meter CW contacts with European stations with the 1-Watt output of a Heathkit HW-8 transceiver.

If possible, a QRP antenna farm should have a rotating beam antenna for 20 and 15 meters (and 10 meters someday). At easily attainable heights of 25 and 30 feet (or less), a vertically polarized cubical-quad antenna will outperform a three-element horizontal beam.[4, 5] I worked YU5FAM in Yugoslavia with my vertically polarized quad with the 2-Watt output of a Heathkit HW-8 transceiver. This quad was fed with tuned feeders, and it loaded up and worked well on 15 meters also. For QRP operation, using tuned feeders is the best way to get the rf from the transmitter into the antenna.

Where space is limited, you could use a combination of vertical and horizontal elements or a vertical-slanter. If you have lots of space, you could try vee-beam or rhombic antennas aimed in favored directions. Low-frequency triangle or quad loops are other possibilities.[6, 7] The "Loop Skywire" antenna described in the November, 1985, issue of *QST* should be an excellent performer for QRP operation. All of these antennas should

be fed with tuned feeders for best performance in QRP operation.

Tuned feeders will also provide full-frequency, all-band coverage with fewer antennas than if coax feed is used. To obtain similar but less effective results with coax-fed antennas, four different antennas would be required: one for 80-meter CW, one for 75-meter phone, one for 40-meter CW, and one for 40-meter phone.

Even with four coax-fed antennas, the results would not be as good as those obtained with the one tuned-doublet antenna system because the tuned doublet can be tuned to *resonance* on *any* frequency on *any* of its bands. On 40 meters, the tuned doublet would have a gain of 1.8 dB as compared to either 40-meter coax-fed antenna. Furthermore, unless these four antennas could be located quite far from each other, they would interfere with each other.

Special Considerations

Antennas for QRP operation should have *gain* as compared to a half-wavelength dipole for the frequency in use. An 80-meter tuned doublet (center-fed zepp) has gain as compared to a dipole on all of the higher frequency bands. On 80 meters, it has some gain as compared to an 80-meter coax-fed dipole, both because it can be tuned to resonance at the *exact* frequency being used and because the feedline (open-wire or twinlead) has less loss than coaxial cable.

The old adage "If you can't hear 'em, you can't work 'em" is as true today as when the statement was first used. Having the ability to switch instantly from one antenna to another often makes it possible to hear a station after it fades out on the first antenna. To make use of antenna switching during reception, all of the antennas must be tuned to the frequency being used. When the station to which the operator is listening starts to fade, he can quickly switch to the other antennas and listen. He will use the antenna that brings in the station the loudest. This switching of antennas has saved many QSOs.

Incoming signals often change polarization, and this causes fading (QSB). Having one antenna with vertical polarization and another with horizontal polarization is useful for reception purposes. Having three antennas to which the operator can switch provides even more chances for good reception.

"If they can't hear you, they can't work you" is also true. Generally speaking, when operating QRP, it is a good idea to transmit using the antenna that has the most gain in the desired direction. A quick on-the-air check with the station at the other end can sometimes be used to determine which antenna should be used in transmitting.

For amateurs living in apartments or condominiums where no (outside) antennas are allowed, systems with gain as compared to a dipole are possible. NF0R has had antenna systems in the attic of his condominium. One of these consisted of two equal lengths of aluminum foil fed with tuned feeders made out of a good grade of twinlead. Another of his antennas was a tuned doublet with the ends of the wires bent around to fit the available space. NF0R has worked into Australia with 5 Watts of rf output using one of his attic antennas.

You should try out many different antenna systems until you find ones that will work well in your particular location. Get them up in the air as high as possible! I hope that this article will help you design, build, and use the best QRP antenna farm that your space will permit. ■

References

1. Doug DeMaw W1FB, "Some Words About Antennas," *QRP Notebook*, ARRL.
2. Adrian Weiss K8EEG/W0RSP, "Antenna Capabilities: Notes for Novices," *The Joy of QRP, Strategy for Success*, Milliwatt Books, 833 Duke Street #83, Vermillion SD 57069.
3. William I. Orr W6SAI and Stuart Cowan W2LX, "A Universal H-F Antenna System," *Simple Low-Cost Wire Antennas for Radio Amateurs*, Radio Publications, Inc., Box 149, Wilton CT 06897 (1972).
4. Orr and Cowan, *All About Cubical Quad Antennas* (2nd edition).
5. Wayne Overbeck N6NB, "Quads Vs. Yagis Revisited," *Ham Radio*, May, 1979.
6. "Long Wire Antennas," ARRL *Antenna Book* (13th and 14th editions).
7. Edward M. Noll W3FQJ, *73 Dipole and Long-Wire Antennas* and *73 Vertical, Beam and Triangle Antennas*.

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The Cellular Phony Antenna

Okay, okay, it's a little bit vain to want a two-meter mobile antenna that looks like it's hooked up to a cellular phone—but this way you save $1200.

If you live in a U.S. metropolitan area, you've probably heard of "cellular telephone." Most cars that have cellular telephones sport a small black antenna with a "curly Q" phasing coil in the center. Mobile phones have been around for years, but this funny little antenna has become a status symbol. "Yuppie phone" is its nickname around these parts.

Well, no need to fret. No need to spend $1,200 for a cellular telephone. Your trusty 2-meter rig has been autopatching you for years. At the local 2-way shop, I found out that a couple of antennas have been sold to people who have no intentions of having a cellular phone, but simply want the antenna as a status symbol. Let's combine the two and create the ham radio "cellular phony" antenna that you can use on 2 meters.

Advantages

First, there is nothing like pulling up alongside a cellular-equipped Mercedes 280SL with your pickup truck sporting the same cellular antenna. It's almost like beepers. Remember when only doctors had them? Now the janitorial services carry them.

The second reason for sporting one of these antennas is that, if stolen, a cellular phone is difficult to get rid of since each one transmits a unique serial-number identification. As soon as the owner reports it stolen, the ID is locked out of the system and the phone is useless. Ham gear and CB rigs, however, can easily be used by someone else, so thieves will go after them. Also, some, if not most, of the cellular phones are locked into the mounting bracket very securely. Consequently, thieves will pass up the car with the cellular antenna. This makes the "cellular phony" antenna attractive to the 2-meter FM mobile user.

Finally, this particular antenna detaches at its base, so going through the car wash doesn't damage it. And it is black, which makes it almost impossible to see at night. You should consider this antenna as your next 2-meter FM mobile antenna.

Disadvantages

Yes, there are a few minor ones, which I will discuss. I want the neophyte ham to be able to learn from this article as well as have fun, too. For you antenna purists, you'll claim less than unity gain.

First, the antenna, being less than a quarter wave in length, actually becomes a loaded quarter wave. I do not have complex measuring gear to confirm my claim, but the surface area is virtually identical to a quarter-wave vertical. Its height is 16", which is a very good percentage of an 18-1/2" "full-length" quarter wave. After all, hams get good results with 8-foot mobile antennas on the low bands and with stubby ducks on VHF and UHF.

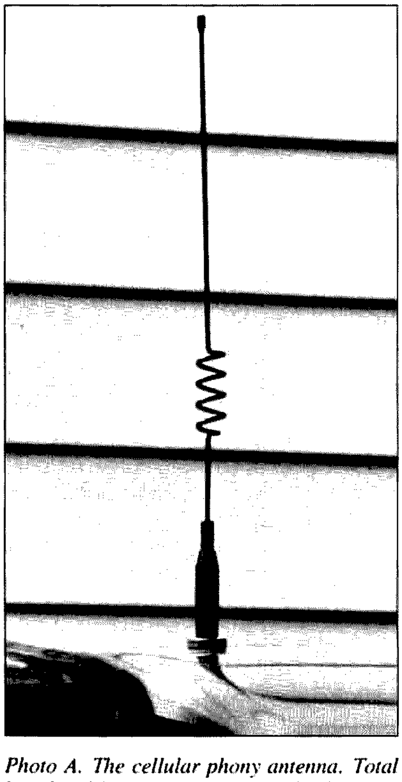

Photo A. The cellular phony antenna. Total length is 16 inches from tip to end of base.

Think of it in terms of an 80-meter vertical, which should be about 66 feet high. The "cellular phony" antenna is the same percentage of a quarter wave that a 55-1/2-foot vertical is of the 66-foot vertical. Many hams use antennas shorter than that on 80 meters and have excellent results.

Having a 16" high antenna on a minivan still gives you garage-door clearance. I have field-tested the antenna on distant repeaters, dead spots, and fringe areas and found no difference from a quarter-wave antenna.

The second problem is swr bandwidth. I found 1.4:1 swr at 144.00 and 148.00 MHz, with 1.2:1 at center band. Again, for you antenna purists, it isn't perfect, but it is totally acceptable.

Other antennas I have used are flatter and have greater bandwidth. The reason for this is that a loaded shortened antenna will exhibit narrower bandwith than a full quarter wave. The antenna did not exhibit a 1:1 "perfect" match because shortened antennas exhibit a lower feedpoint impedance; when fed with 50-Ohm coax they cause standing waves at the transmitter. With 1.4 on the band edges and 1.2 at center frequency, building a matching device is just not worth the trouble.

Finally, for a couple of dollars, you can buy a BNC adapter, which allows use of the antenna on most HTs. There also are adapters available for Antenna Specialists and Motorola bases if you currently are using one of those but wish to "upgrade" to a cellular phony antenna.

Mounting the Antenna

As you can see from the picture, this antenna is roof-mounted. A 3/4" hole must be drilled into the roof using a circular hole saw, which can be purchased at the local hardware store for about $6. ORA Electronics (20120 Plummer Street, PO Box 4029, Chatsworth CA 91313; 800-423-5336) also offers a

trunk-lip mount and an interesting new window mount that clips onto the top of a rolled-down window and is rolled into place when the window is closed.

The antenna has a TNC connector at its base. To adjust the antenna rod, loosen the Allen setscrew (located at the top of the connector) to remove the antenna, and then shorten the antenna to the required frequency. I had to remove about an inch from the antenna. This may vary in your application, due to such variables as type of mount or mounting position on the vehicle.

Pruning the Antenna

The out-of-the-box starting point showed the lowest swr at 142 MHz. That means that virtually whatever variation you choose, you should be able to prune the antenna to frequency. Like other quarter-wave antennas, a 1/4" cut resulted in moving the lowest swr *higher* by 1 MHz. After mounting the antenna, simply tune it by pruning it to obtain the lowest swr at 146.00 MHz. By using a synthesized rig, you can make plots of frequency versus swr and watch the antenna fall into place.

The best way to prune the antenna is to carefully scrape the black plastic coating off the antenna rod with a knife so that the Allen screw makes good connection with the rod. Use a triangular file to make a groove around the bare antenna rod, then snap the excess rod off with a pair of pliers. Reinstall the antenna rod on the TNC connector and tighten the Allen setscrew. Now check your swr and repeat the process if necessary.

My finished antenna measured exactly 16 inches from the tip to the bottom of the TNC connector after pruning, and the lowest swr occurred at 145.75 MHz. I also tried the antenna on the 440-MHz band: The swr was about 1.3:1 across 440 to 450 MHz—not as good a performance as I would have liked. I suspect a high angle of radiation, but nevertheless the antenna can be used on 440 for local or emergency communications.

Parts List

Item	Description	Part Number	Price
High-end cellular antenna mast	Black polynoxo finish, for use with any CMR series mounts or adapters	CMR-488	$19.00
Cellular antenna mount	Standard 3/4" hole mount with 16 feet of RG-58 coax, low-profile black finish. Accepts all CMR-type antennas	CMR-MT-311	10.75
Cellular trunk-lip mount	Adjustable angle design, made of stainless steel in black polynoxo finish. Comes with 16 feet of RG-58 cable. Accepts all CMR-type antennas	CMR-MT-540	18.00
Cellular window mount	Comes with 16 feet of RG-58 cable. Accepts all CMR-type antennas	CMR-MT-688	23.60
Antenna adapter	Antenna Specialist mount to CMR antenna	ASA85	5.00
Antenna adapter	Motorola mount to CMR antenna	MTA94	5.50
Adapter BNC to TNC	For mounting antenna on HTs	TNC98	1.80
Conventional PL-259 connector		PL259	1.10
Reducer for RG-58 coax		UG175	.40

Parts

I bought the antenna (called the "high-end cellular antenna mast") from ORA Electronics. Other cellular antennas may not work because different manufacturers vary their designs. In addition to the antenna, you'll need a base or an adapter. The three types of bases mentioned earlier are listed in the parts list along with the three adapters available. Finally, you'll need a PL-259 connector and a UG-174 reducer for the RG-58 cable, if you don't all ready have them in your junk box. ■

Danny J. Conner KD5UJ
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Carencro LA 70520

Weatherproofed Antennas

KD5UJ shows you how to keep the elements out of your elements.

Most amateurs experience recurring problems with their antenna systems. Every summer most of us are pulling our antennas down because they're not working properly. By following the procedure which follows, you can eliminate this yearly ritual.

Where I work, technicians provide communications for the oil industry both on- and offshore. It's not unusual for an antenna system that we put out on an offshore platform to operate successfully for more than three years without requiring *any* maintenance.

These repair/installation instructions assume that you're working on an aluminum antenna that requires assembly, such as a beam or a vertical. (Some of these suggestions will be helpful when working with wire antennas also.) If you're dealing with a new installation, the first thing you need to do is install the connector on the feedline. Since most amateur antennas require UHF connectors and most amateurs use coaxial cable, your installation will make use of PL-259 connectors.

Strip 1-1/8" of outer insulation off the cable (see Fig. 1), being careful not to nick the braid. Tin the braid, but don't overheat it. Overheating will make the insulation bubble out, making soldering to the connector difficult. After it is cool to the touch, use a sharp knife and strip the braid and inner insulation off, leaving approximately 3/8" of braid exposed. Be careful not to nick the center conductor. Tin the center conductor and slide the coupling ring onto the cable. Screw the connector body onto the cable, being careful not to damage the outer insulation.

At this point, trim the center conductor even with the end of the connector body. If your connector body is chrome-plated, use a knife to scrape around each hole to get a smooth solder flow. If it's silver-plated (dull silver), scraping isn't necessary.

Solder the braid to the connector body through the holes on the connector body. (Be sure solder drops through the holes.) After the connector cools, solder the center conductor to the connector body. Use an ohmmeter on its highest scale (R x 10,000 or higher) to ensure that no continuity exists between the center conductor and the shield.

If you are repairing an existing installation, perform the resistance check on your feedline to determine if replacement is necessary. Make sure both ends of the feedline are disconnected prior to performing the check.

If you're rebuilding an antenna, you will need some 200-grit wet/dry sandpaper to clean off the corrosion. For a good electrical connection take extra care where sections of the antenna connect. Soak all hardware in WD40 and clean it with a wire brush. Replace any pieces that show excessive corrosion.

After cleaning the old antenna, or prior to putting the new one together, you will need to protect it from corrosion (and from icing over, for those living in the winter wonderlands). To do this, saturate the antenna with CRC 2-26 or another similar product and allow it to dry for about an hour prior to assembly. After assembling the antenna, respray it liberally with the CRC 2-26.

The next step is by far the most important. This is where most antenna failures occur—connecting the feedline to the antenna. If you are using UHF connectors (PL-259, SO-239), then you need to get a tube of clear (*not white*) silicone heat-sink compound (Z5 compound). Fill the hole in the female side of the connector with this compound.

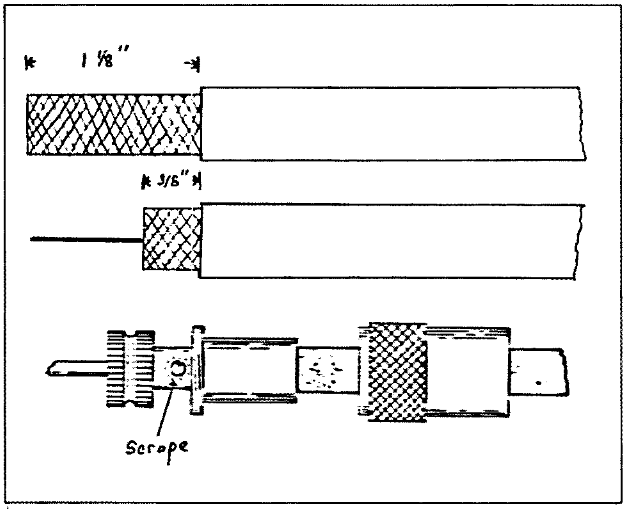

Fig. 1. Installation of a PL-259 connector.

Screw on the male side of the connector until it's hand tight. Then use a pair of channel-lock pliers to turn the connector an extra 1/4 turn. Be careful, since you can damage the connector by over-torquing. If you are using N-style connectors, *do not* put silicone in them! They have no free space inside them, so using silicone can cause damage or distortion. Clean any excess silicone off the cable and connector.

After connecting the feedline to the antenna, you will need to waterproof it. Start with a good-quality electrical tape such as Scotch 88T. Tape the connector, overlapping the layers at least 50 percent of the tape thickness, and continue taping down the cable approximately 4–6 inches past the connector.

Next, liberally coat the taped connector with Scotch Kote™—don't use commercial antenna wrap, as it is messy and hard to apply and you can't be sure there are no cracks or air bubbles in it. Allow the Scotch Kote to dry about 10–15 minutes, then retape the connector and again coat it with the Scotch Kote. This substance won't come off, and the better you tape and Scotch Kote your antenna, the longer it will last.

If you're building wire antennas, you should tape and Scotch Kote the point where your feedline connects to the legs of the dipole, vee, or sloper.

After mounting or remounting your antenna, you should be able to sit back and enjoy your antenna system. The only maintenance I would suggest, for those whose installations permit, would be to liberally spray the antenna with CRC 2-26 approximately every six months. This will ensure protection from corrosion and help maintain electrical continuity between the sections. ■

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Tube Terror

Will the vacuum tube thermionic generator change the world as we know it? Probably not.

The chill of the gritty concrete floor against the side of my face roused me to consciousness. I was lying, I gradually realized, on my side in a dimly lit place.

My knuckles brushed against metal as I sat up. An arm's reach away, a steel beam protruded vertically from the floor. A dust-coated cardboard carton sat next to the beam.

I looked around. I was in a warehouse, I discovered, the largest warehouse I had ever seen. The aisle I was in vanished in the dimly lit distance, bounded on either side by row after row of cartons resting on steel shelving.

I looked up. The nearby steel beam went up and up, disappearing into a smoky haze. I couldn't see the ceiling, the source of the dim light, or the tops of the stacks of cartons.

There was writing on the cartons, I noticed. The closest one read "1B3-GT"; across the aisle, another carton read "1D5-GT." Vacuum tubes? What was I doing in a warehouse full of vacuum tubes?

I became aware of a shadowy, robed figure standing a few yards away. "Who are you?" I muttered. "And what am I doing here?"

The figure lifted an arm and a bony hand protruded from the sleeve of the robe. "I am the Spirit Of Radio and you are in the Warehouse Of Tubes Past. Before you can leave, you must find an application for every tube in the warehouse."

A rising tide of panic gripped me. "You can't be serious—nobody designs with tubes these days!"

"You must or you will never leave," the spectral figure whispered. The hood fell away and, instead of a face, I saw the screen of a cathode-ray tube bearing the image of Lee DeForest, inventor of the triode.

"Before you can leave, you must find an application for every tube in the warehouse."

I gasped and ran—down the aisle past the 2CY5s, the 3V4s, the 5U4-GBs, the 6A7s—chased by the shadowy figure. A protruding carton of 6L6s tripped me and I fell headlong. . . the floor melted beneath me. . . .

I woke up on the sofa, an opened copy of the 1957 *RCA Tube Manual* resting on my chest. It was just a bad dream.

* * * * *

What follows is probably the last conceivable application of the vacuum tube. Certainly, all the obvious uses for tubes have been exploited. Why, once upon a time, clever people built transmitters and receivers and even computers using vacuum tubes!

But it occurred to me that a tube is more than just an amplifier, an oscillator, or a rectifier. It's also a power source.

A number of years ago, a device called the "thermionic converter" was invented. It consisted of a source of electrons and a collector. The electron source was made of an element that "boiled off" electrons when heat was applied. The collector gathered the electrons and delivered them to the circuit to be powered.

The heat source, as I recall, could be anything from a solar collector to waste heat from an industrial engine as long as the source's temperature was 800 degrees Kelvin (or greater) for reasons of efficiency.

Okay, so what's a vacuum tube but a source of electrons and a collector, all neatly packaged in an easy-to-use form—with a built-in pilot light, even?

I dragged out a carton of tubes and rummaged through them until I found a 6W4-GT, a television damper diode. The transformer junk box yielded a 117-to-6.3-volt filament transformer and, with the aid of some clip leads, I breadboarded the circuit of Fig. 1.

I waited impatiently for the 6W4 to warm up, and attached a digital voltmeter. The open-circuit voltage delivered by the tube measured 3.35 volts polarized as shown (plate negative, cathode positive). Remember, the tube's plate is acting as an elec-

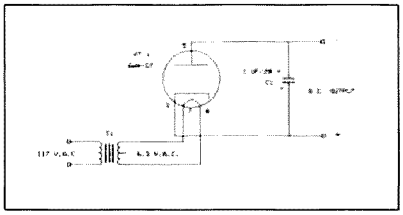

Fig. 1. The first circuit.

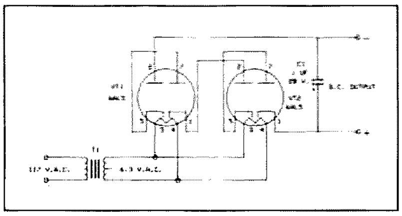

Fig. 2. The second circuit—.0023% efficient.

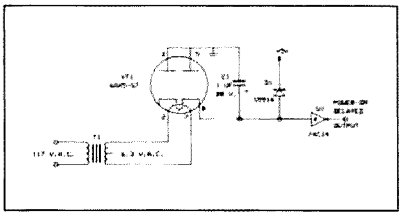

Fig. 3. The ac power-on delay circuit.

tron "collector" and hence has a negative charge.

Under a 4.7k-Ohm load, the output voltage sagged to 0.47 volts, which corresponds to an output current of a smashing 100 microamperes. Clearly, we're not going to put Boston Edison out of business!

While the output from the 6W4 was pure direct current, the tube's internal impedance is quite high relative to a more conventional source, and 60-Hertz noise pickup occurred with my clip-lead lashup. Capacitor C1 acts as a noise bypass and reservoir capacitor.

For my next experiment, I selected a pair of 6AL5 duodiodes and connected the diode sections in series to obtain 3.2 volts open-circuit (0.8 volts from each diode section) and 190 microamperes short-circuit current. Under a 19.2k-Ohm load, the circuit's output voltages dropped to a measly 1.3 volts. See Fig. 2 for the circuit schematic.

No analysis of any power source would be complete without a look at the circuit's efficiency. One 6AL5 draws 0.3 Amperes of heater current at 6.3 volts or 1.89 Watts. Two 6AL5s consume 3.78 Watts and deliver 88 microwatts for an efficiency of. . .0.0023 percent!

"Two 6AL5s consume 3.78 Watts and deliver 88 microwatts for an efficiency of. . . 0.0023 percent!"

Is there any practical use for such a miniscule power source? Fig. 3 shows one idea. The 6AX5-GT full-wave rectifier duodiode is powered from a switched ac power line. As the 6AX5 warms up, its output voltage climbs until it exceeds the trigger voltage threshold (3.6 volts typical, 4.3 volts maximum) of one section of a 74C14 CMOS hex Schmitt trigger IC.

The 74C14's output is thus time-delayed from the initial application of ac to the 6AX5's heater circuit. Under no-load conditions, the 6AX5 delivers approximately 5 volts, and diode D1 is incorporated to prevent overstressing U1 in case a figuratively "hot" 6AX5 is plugged in. If the reverse leakage current of D1 is excessive, you may wish to add a 1-megohm resistor from the junction of D1 and C1 to ground.

If you'd like to experiment further, try using gridded tubes as thermionic power sources by tying all grids to the plate for maximum electron collection. See what happens when a grid is connected to the tube's cathode instead of the plate (excuse me, the collector).

There you have it. Arguably, the "vacuum tube thermionic power source" is the world's least efficient generator. Keep it in mind, though, just in case you ever find yourself locked in a warehouse full of tubes with a shadowy robed figure. ■

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The Ducky Doctor

Heat-shrink tubing gives you a flexible fix for your cracked rubber ducky.

With 144-, 220-, and 440-MHz handie-talkies enjoying high popularity, the rubber-ducky antenna is much in demand. At a recent local ham flea market, at least half the hams there had an HT—either clipped to the belt, hanging out of a back pocket, tucked into a shirt pocket, or grasped in the hand. In all but the last position, the rubber ducky takes a lot of abuse as the wearer moves about.

Now we all know that rubber duckies are flexible. One rubber-ducky vendor at the flea market put a 90° bend in one ducky to demonstrate its flexibility and ability to snap back to a vertical position. This is fine and good for new rubber duckies, but after several years the covering becomes brittle and can crack.

My wife's (W6ANT) rubber ducky developed such a crack, and its ever-increasing size eventually caused some concern. By the time the crack had extended about one-half inch, I could see the innards of the ducky—a coil of wire wrapped on a foam plastic core. I was concerned about: 1) the rubber-ducky wire breaking with continued flexing, 2) moisture getting inside and causing a mismatch, and 3) the wire corroding because of exposure to salt air.

To prevent these things from happening, I had to repair the crack in a way that would: 1) add strength to the rubber ducky, 2) keep moisture out, 3) protect the wire, 4) retain the flexibility of the rubber ducky, and 5) be a permanent fix. I knew from experience that electrical tape would not add enough strength—it wouldn't withstand the abuse a rubber ducky gets. Epoxy would seem to fit most of the requirements, but it's not flexible and might crack and fall off with use.

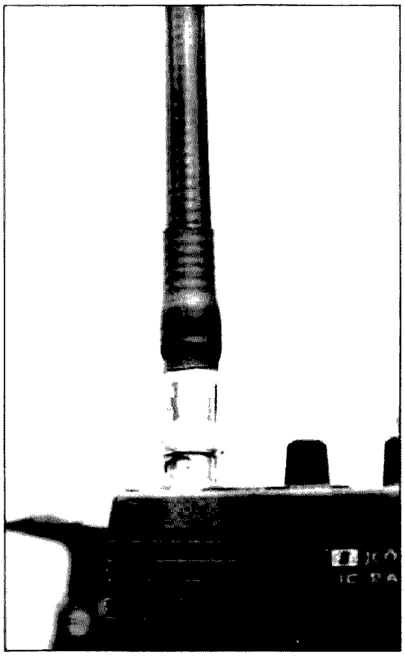


Photo A. The shrink-tubing fix is on the lower portion of the rubber ducky.

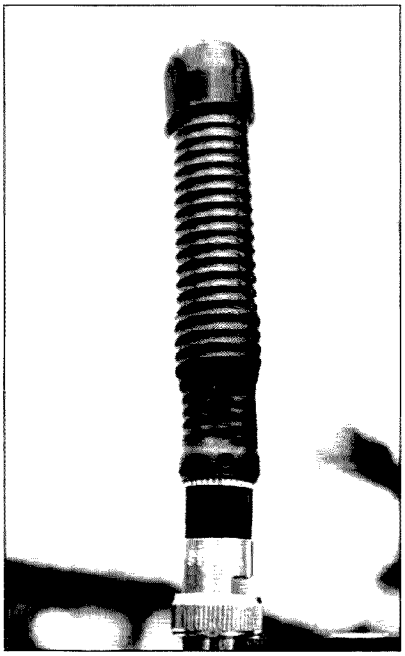


Photo B. A stubby ducky with a shrink-tubing fix.

The solution was to use a permanent sleeve made of shrink tubing, a type of plastic tubing that shrinks when heat is applied to it. It is available at many electronics stores, such as Radio Shack (# 278-1627) or Dick Smith Electronics.

W6ANT's rubber ducky with shrink tubing in place is shown in Photo A. The shrink tubing is seen as the extra covering on the lower part of the rubber ducky. It really blends in well with the original cover of the antenna.

Making the Repair

1) Measure the largest diameter of the rubber ducky over which the tube must slide. On my wife's rubber ducky, I slipped the tubing over the top, since that is smaller than the BNC connector.

2) Buy a piece of shrink tubing just barely large enough to slip over this diameter. The tubing can shrink to approximately 50% of its original diameter.

3) Cut a piece of the tubing about one inch longer than is necessary to cover the crack (about one-half inch in each direction).

4) Slip the tubing on the rubber ducky and center it over the crack.

5) Apply heat to the shrink tubing.

6) When cool, verify the tight fit and the added strength with flexibility.

Applying heat is the tricky part. Years ago, when I worked in a lab as a design engineer, I used a heat gun to shrink the tubing. A heat gun looks a hair dryer. When you "pull the trigger," the element heats up and a small but powerful fan blows hot air out the front.

What did I have at home that would serve the same purpose? Why the XYL's hair dryer, of course. Forget it! After 15 minutes with the dryer on high, the tubing had not shrunk even one millimeter! The air was just not hot enough.

I thought about using a match, which might work, but an open flame would be too uncontrollable. One slip and the tubing and rubber ducky might start to burn.

Finally, from my junk box I pulled an old heating element from an oven that I salvaged many moons ago. It was rated for 120 volts, so I attached a line cord and mounted the heater on a couple of metal shelf brackets to keep it from burning the workbench. As the element began to glow, I held the end of the rubber ducky with the shrink tubing about an inch from the glowing coil and rotated the ducky continuously.

Rotation is very important—it allows you to shrink the tubing evenly while not overheating the rubber ducky. Within minutes, the shrink tubing fit snugly against the ducky. I unplugged the heating coil and let the ducky cool about ten minutes.

Lacking an old oven heating element, you could shrink the tubing over an element on an electric stove or hot plate. Be careful not to overheat the rest of the rubber ducky. The end near the connector gets the most bending, so most repairs will probably be at that end of the rubber ducky.

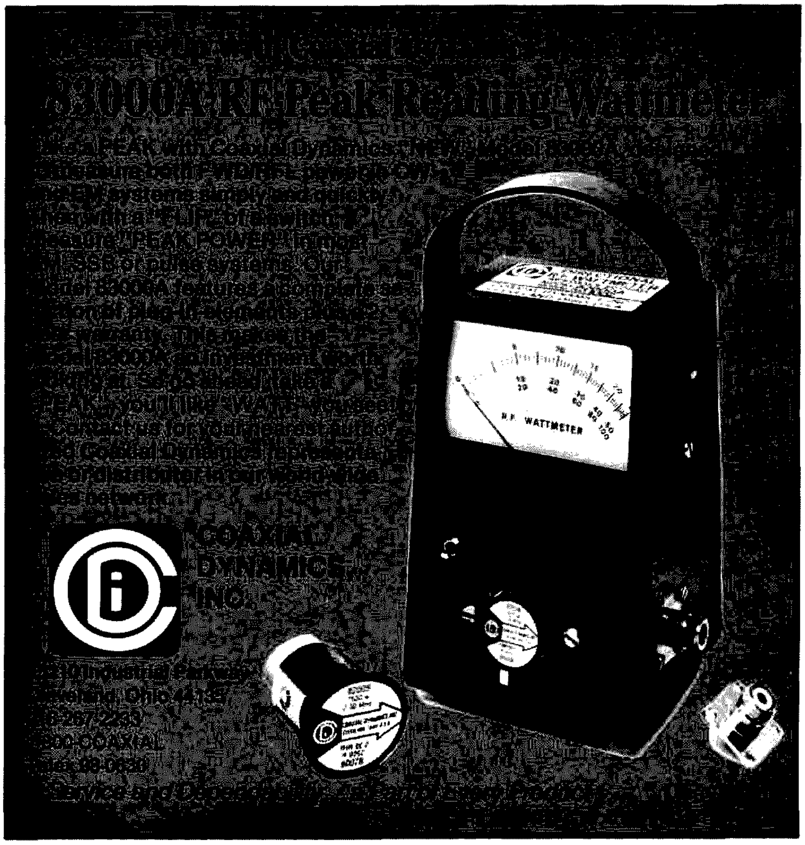
Other Fixes and Uses

The stubby ducky on my HT also developed a crack. I used the same technique to fix it. The repaired stubby ducky is shown in Photo B. The shrink tubing half covers the knurled metal band, which is above the black plastic tube directly above the BNC connector. The BNC connector, as well as the short black tube, unscrews to mount the 5/8-wave antenna that came with the stubby ducky. This made slipping the shrink tubing on easier than on the full-size rubber ducky. Even with this shrink tubing in place, the extent of the original rip is evident.

5/8-wave and 1/2-wave HT antennas have a flexible matching coil at the bottom. The technique described here could be used to repair the covering on the matching coil, if needed. For those who like to build their own antennas, covering the matching coil with heat-shrink tubing will provide protection and make the job look professional.

Shrink tubing is available in different colors. You might even decide to color-code your rubber duckies—say, black for 2 meters, yellow for 1-1/4 meters, and red for 3/4 meters. There would be no mistaking an extended 440-MHz ducky for a 2-meter rubber ducky if it had a color band of shrink tubing around the base or at the tip.

The two repaired duckies have been in use for about a year with no noticeable difference in radiation characteristics or any mechanical problems. If you have an injured rubber ducky, this fix will have your antenna up and about in no time flat. ■



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Tuner Transformation

Make your Heath SA-2500 antenna tuner truly automatic.

While I haven't heard of any fingers getting worn out from adjusting the dials of an antenna tuner, the three-handed balancing act it takes to get on the air is not something I look forward to. The Heath SA-2500 automatic antenna tuner looked like the answer to more than 20 years of trying to use one none-too-optimized antenna for all HF bands. Just put a little power into it and let it find its own match.

Almost!

Probably to limit the already very complex circuitry, the SA-2500, although equipped with a motor to drive the rotary inductor, requires you to set up to 18 different preset points on that coil, nominally two for each band. Unlike some other designs, the tuner does not use these presets as a starting point to find the optimum amount of inductance; the designers have relied on turning only the capacitors to find a match.

Although theoretically capable of matching nearly anything with its high-pass-filter type circuit, the SA-2500 has a tuning range that is quite limited once a preset has been set. And for absolutely no reason I can think of, Heath has chosen to mount the 18 preset-control potentiometers on the main circuit board. You have to remove eight little screws from the top cabinet cover to get to them.

Also, I can't understand why the circuit won't let you set the inductor manually and find the best match from there. If you go into automatic, the roller coil just spins back to the preset point.

In the case of my wire antennas, I found that daily variations (hot and cold, ice on the trees) were affecting the system so that the tuner could not get an adequate match. This was a real disappointment. Running a tuner without its top cover is poor practice, and fiddling with those printed circuit controls makes a mockery of the automation electronics I spent a week assembling.

There are two obvious answers—cutting a trap-door in the top cover or outboarding the potentiometer array. The first is pretty crude. While the second could actually be worked via the 9-pin connection on the back, the thought of a little box with nine pots to turn was a bit much to take. Then, too, there was the problem of how to watch D359, the LED that lights when you've matched the electronics with the roller inductor position.

"Daily variations were affecting the system so that the tuner could not get an adequate match."

Several hours of staring at the schematic and the manual's none-too-clear explanation of the relevant circuit yielded an answer. By replacing a single fixed resistor with a remote potentiometer, I could vary the range of *all* the pots up or down, quickly and accurately, just like a vernier. This, of course, voids the warranty, but the unit can be restored to its original condition easily.

Say the original setting for doing 40 meters on the rollers was 12. As modified, the remote potentiometer's value would be set to the same value as the original resistor, so the setting remains at 12.

One fine day (probably the next day) you won't be able to get a match at that setting. A small adjustment of the remote pot will vary the setting up or down until things come into resonance. Now the first try will, of course, have to be experimental, but once you've done it a few times, it will be nearly as automatic as the tuner should have been.

Another nice feature is that after you move the range of all the settings, setting things up on one band (at least in my case) brought all the other settings very close. I was using the same antenna (a small vee) on all bands, so you may not notice this with your setup.

I would highly recommend using a 10-turn precision pot in this application for ease of adjustment and reproducible settings. Using the type with a shaft for a knob instead of the screwdriver-adjust type makes things *much* easier—and it's designed for heavier use. The one that I used (Bourns BP3540S-1-1K) costs about $14, but flea markets and junk boxes are good sources since most people have little use for such pots. A 1k pot should be used.

Similarly, the use of a turns-counting dial makes things much more convenient. This device is made to match the pots, and generally can be found at flea markets attached to some incomprehensible piece of junked test equipment.

Remove resistor R452—it's the 220-Ohm resistor on the left edge of the main circuit board of the SA-2500, when looking at the unit from the front. Now set your 10-turn pot to 220 Ohms, using an ohmmeter. Attach a pair of shielded wires to the points where R452 used to be and run the wires out of the cabinet to your 10-turn pot—one wire to the wiper connection, the other to the pin 1 end. This would be pins 1 and 2 of the Bourns control mentioned before.

Of course, you should ground the braid of the shielded wire near its end. If you don't have two-conductor shielded wire, use two pieces of RG-174/U and ground both shields. The length doesn't seem especially critical, but since you're apt to have a lot of rf floating around, try to keep it short. You might be able to figure out how to mount the pot on the front panel, but I couldn't—unless you want to sacrifice use of the antenna switch.

I found there is plenty of room between the

multiple-pin connectors and the chassis for slipping wires. You may have to use normal RFI measures on the wire (ferrite beads and capacitors), but I noticed no changes running the full legal limit. You also might want to put the potentiometer in some kind of box to make it look nice.

Setting the dial to something appropriate, such as 5 if it's a 1-to-10 scale, will give you a reasonable frame of reference. To match the resistance value, 2.2 also would be a good choice.

And that's it. If you don't change anything, your settings will stay the same. You can override the preset when you need to and still preserve the automatic feature. When you do, remember to turn the dial slowly and keep an eye on the readout, since you don't—under any circumstances—want to let the inductor run against the stops.

A Few Notes

While the manual doesn't specify it, communication with Heath indicates that the gray multi-conductor cable coming from the sensor assembly should be dressed away from the variable capacitors and placed flat against the rear panel. Otherwise, due to the very high voltages encountered, an arc can develop from the capacitor to the cable, with disastrous results.

"Using a coaxially fed antenna is not what I call a solution!"

Heath also suggests that turning the antenna-selector switch be done with a sharp, snapping motion, due to the flexing in the 16" shaft. Using a gradual motion may leave the selector switch set in some in-between position.

Finally, high-power rf and solid-state electronics don't always mix too well. In my case, I noticed that the tuner easily found a match at low power, but as soon as I switched to high power, the motors ran continuously. The Heath service consultant said he had heard about this before but could offer no solution. "Use a coaxially fed antenna" is not what I call a solution!

The easiest answer is to let the tuner find the match at low power and then switch into manual mode. I was able to improve the grounding (by using a resonant ground), so the problem went away. I also improved the shielding by scraping away the paint around the cabinet screws wherever the two halves of the cabinet came into contact with the chassis.

With these provisos in mind, if you're going to be chasing DX up and down the frequencies, or even if you prefer just getting on the air to fiddling with knobs, the SA-2500 is a useful accessory at a price not much higher than a manual tuner. ■

THE COMPLETE TEXT OF DOCKET 86-161, THE FCC'S FINAL RULING ON NOVICE ENHANCEMENT

1. On April 18, 1986 in response to several petitions for rule making we adopted a Notice of Proposed Rule Making (51 FR 17074 May 8, 1986)(Novice) proposing to enhance the privileges authorized by the Novice amateur operator license. The enhanced privileges would be in the HF 10 meter, VHF 1.25 meter and UHF 0.23 meter bands with transmitter peak envelope power maximums of 200 watts, 25 watts and 5 watts respectively. We proposed all authorized emission modes for the VHF and UHF bands and emissions A1A, F1B and J3E for the HF subband. We also requested information on related issues including the number of questions appropriate for the Novice operator written examination, the number of volunteer examiners (VEs) required to properly administer a Novice operator examination and whether a better balance between the requirements and privileges of the Technician operator license would be helpful. More than 350 comments were filed, including four reply comments.

2. The proposed enhanced Novice class privileges were intended to create a greater desire in new entrants into amateur radio to stay with the hobby and advance through its five tier licensing structure. In this way, the licensing structure would become more responsive to the needs and desires of the amateur community. The other proposals and questions were generally related to the increase in Novice privileges or to the basic licensing procedures.

Comments

3. More than 80% of the commenters supported the proposal. They believed that enhanced Novice operator privileges would attract and retain more persons in the service. In addition, manufacturers and distributors of amateur radio equipment said they hoped it would curb the loss of operators and consequent declining sales of equipment. The major concern in the comments was that excessive privileges could diminish the incentive for Novice operators to upgrade to a higher operator license. Also objected to was authorizing present Novice and Technician operators licensees any additional privileges without requiring them to qualify by further examination.

4. The comments favored expanding Novice operator HF 10 meter privileges to 28.1-28.5 MHz. The International Beacon Project, the International Amateur Radio Union and other commenters were concerned that such an expansion could jeopardize the usefulness of the amateur beacon system. They believed that amateur stations in other countries would be driven to transmit on beacon system frequencies in order to avoid congestion caused by an influx of stations with Novice and Technician control operators. The American Radio Relay League, Inc. (ARRL) stated, however, that amateur operators traditionally observe voluntary operating restrictions when necessary for the protection of universally beneficial operations like the beacon system.

5. The Notice of Proposed Rule Making in this proceeding proposed that Novice control operators be authorized privileges in the entire VHF 1.25 meter band. The comments generally supported this proposal because it would provide a common meeting ground for new amateur operators to meet experienced operators. In commenting on our statement that we will not finalize this aspect until certain related allocation matters for the 216-225 MHz band are resolved, ARRL said that this proceeding has no connection with frequency allocation decisions. It stated that the inclusion of Novice operator privileges on a band already available to the Amateur service would not affect future allocation revisions.

6. Richard S. Mosseson and other commenters pointed out that the proposed UHF 0.23 meter Novice operator privileges were not in keeping with the ARRL voluntary band plan. In its reply comments, ARRL acknowledged the discrepancy and requested the subband be at 1270-1295 MHz where repeater operation is conducted. Also mentioned in the comments was a potential biological hazard to the operator of a station transmitting in this frequency range.

7. The comments favored all emission modes in the VHF and UHF bands so Novice operators could communicate using modern technology. Dissatisfaction with the telegraphy only privileges was blamed as a major cause of Novice operators dropping out of the Amateur service. Although most commenters favored limiting Novice operators to emissions A1A, F1B and J3E in the 10 meter subband, a few commenters urged authorization of emission A3E. Still other commenters considered any HF emission privileges for Novice operators beyond A1A as a disincentive to upgrading. In its reply comments, ARRL said that enhanced privileges in the limited frequency bands proposed would operate as an incentive for Novice operators to upgrade. About 5% of the commenters were apprehensive that Novice operator telephony privileges in the 10 meter band could attract unlawful operators from the nearby 11 meter band.

8. Novice operators were asked to comment on the proposal to limit their stations to low transmitter power while higher class operators could transmit on the same frequencies with high power. The comments stated that this would place Novice operated low power stations at a distinct disadvantage. It was also suggested that all stations transmitting on the Novice subbands be restricted to low power. It was noted that higher class operators would lose existing privileges if this approach were taken.

9. The comments generally concurred that the topics on the Novice operator written examination should correspond to the privileges authorized. They favored increasing examination Element 2 to 30 questions or even to 50 questions. The repeated concern was that Element 2 should not be so difficult as to discourage newcomers.

10. Twenty-one percent of the comments discussed ARRL's request for two administering volunteer examiners (VEs). Some 9% of the comments stated that the one VE requirement should be continued because it is more convenient and less stressful for beginners. About 5% of the comments including the ARRL's disagreed and said that enhanced privileges for Novice operators necessitated a second administering VE to minimize the likelihood of examination fraud. Another 7% of the comments recommended that the examinations be prepared and administered under the volunteer examiner coordinator (VEC) system. ARRL opposed this approach because it would increase the burden on the VEC System and reduce the availability of examinations.

11. Comments were requested on confining the written examination for the Technician operator license to the privileges authorized by that license. Gordon West, an amateur operator instructor, stated that such a change would allow instructors to train students preparing for the Technician operator license more thoroughly in relevant VHF and UHF topics. Another viewpoint expressed in the comments was that another examination element would complicate the examination process.

Discussion

12. The prospect of enhanced privileges for Novice operators has already stimulated growth in the service. In FY 1986, nearly 21,000 new persons entered the Amateur service, an increase of 20.75% over FY 1985. More than 19,000 became Novice operators. Furthermore, the number of licenses dropping out of the Amateur service decreased by 15.13% during the same period. We believe these are clear indicators that changes in the entry level license are appropriate.

13. In its proposal regarding the 1.25 meter band (VHF), the ARRL requested that Novices be permitted use of the band 220-225 MHz with all voice and data modes, including radiotelegraphy with a power limit of 25 watts output. However, it asked that repeater operation by stations licensed or controlled by Novices not be permitted, i.e. a Novice signal could be retransmitted by a repeater, but a Novice operator could not sponsor or be the trustee of one. The comments reflected an interest in VHF privileges for Novice operators. In our view, VHF privileges for Novices would create the kind of interest that is needed for amateurs to continue in the hobby and at the same time motivate them to advance to the higher license classes. To this end we will authorize frequencies 222.10-223.91 MHz for use by Novice operators. This action in conjunction with voluntary band plans will allow operation on repeater input and simplex channels. Novices may not be licensees, control operators or trustees of the repeaters. This would permit Novice operators to operate with those modes most appropriate to their level of license and to communicate with more experienced amateurs. For example, frequencies below 222 MHz are typically used for moonbounce, propagation beacons and control signals, activities generally engaged in by amateurs with more experience.

14. We agree with the commenters that the UHF 0.23 meter subband should be at 1270-1295 MHz to allow Novice operators to gain experience with repeater operation. Low transmitter power and incorporation of suitable safety precaution information in the amateur radio practices examination topics should assure that Novice operators will not endanger themselves. Thus, we will authorize the subband at 1270-1295 MHz as requested.

15. The prospect of interference to the 10 meter beacon system expressed in the comments is speculative and may never become a concern, given the record of amateur operators in adhering to voluntary arrangements. Moreover, the low power limit proposed for stations with Novice control operators should satisfy this concern. Thus, it does not afford a reason not to go forward.

16. It is evident from the comments that more emission modes will attract more Novice operators to the Amateur service. However, the frequency ranges in which to use them should provide the proper degree of enhancement so that Novice operators would still have an incentive to upgrade to higher operator licenses. Thus, digital and limited telephony privileges in the 10 meter band appear appropriate and will be authorized.

17. We continue to believe in power restrictions for Novice sections in the new bands. The restrictions will add a further incentive to upgrade the class of license. Also, because of the lesser experience level, Novice operators are more likely unintentionally to cause interference. Reduced power levels will help limit the extent of any interference.

18. When the privileges of any operator license class are modified, the qualification requirements should be revised accordingly. The Novice operator license written examination Element 2 is based upon telegraphy station operation. We believe the examination should be broadened in scope commensurate with enhanced Novice operator privileges. We shall therefore require an additional 10 questions for a total of 30 to make the scope of Element 2 appropriate to the new privileges, without creating a significant deterrent to potential Novice operator examinees.

19. We will adopt rules so that two VEs will prepare and administer Novice operator examinations. Although there may be isolated areas where locating two VEs may be difficult, the added safeguard would be justified. There are legal and practical problems which prevent placing Novice operator examinations under the VEC System. Additionally, to incorporate this work into the VEC system would nearly double the workload and expense for the volunteers operating that system. We will accordingly adopt the two VE procedure and reflect that requirement in a revised Form 810, Application for Amateur Radio Station and/or Operator License.

20. In a related issue, Novice operators may not be upgrading to Technician operator because the content of Element 3 requires them to also be knowledgeable about General class operator privileges. This is the only instance in the operator license progression where the applicant must not only know the material for the operator privileges that will be authorized as the next step (Technician), but also must know the material for the next higher step (General). To require any applicant to be knowledgeable about privileges which the license does not authorize is inconsistent and a burden upon applicants, administering VEs and instructors. To resolve this problem, we will separate Element 3 into two parts. Technician operator questions will be placed into an Element 3(A) VEC question pool and General class questions will be placed into an Element 3(B) VEC question pool. It would be timely to take this action at this juncture for two reasons. First the VEC's will have to revise Element 3 as a result of this action in order to move certain of its questions to Element 2 in conjunction with enhanced Novice operator privileges. Therefore, they could concurrently divide the remaining Element 3 questions into an Element 3(A) and an Element 3(B) as appropriate. Second, the application form is being revised in order to incorporate provisions for Novice operator examination certification by two administering VEs. It could be concurrently revised to include marking boxes for Element 3(A) and for Element 3(B).

Other Issues

21. All present Novice and Technician operators will be authorized the new privileges without additional qualification. However, we strongly recommend that present Novice operator licensees become knowledgeable in the new requirements before using their new privileges. For example, they should study the material in new Element 2 that relates to the enhanced Novice operator privileges even though we will not require that they be examined on it. As to present Technician operators, any examinee holding such a license issued before the effective date of these rule amendments will be given examination credit for Elements 1(A), 2, 3(A) and 3(B).

22. FCC Form 610 is currently being revised in connection with rule amendments pertaining to allowing credit to examinees for certain previously passed written examinations. Those revisions and the revisions required by the action taken in this proceeding are being simultaneously incorporated into the form. Upon receipt of Office of Management and Budget (OMB) approval of FCC Form 610, we will issue a Public Notice with a draft sample of the form attached. The modified FCC Form 610 will provide for certification by two administering VEs for the Novice VE System and for a revised Administering VEs Report.

NEVER SAY DIE

from page 12

the right to change my mind completely if something better comes along.

FREELOADING?

In my February editorial I pointed out—perhaps much too subtly—that we amateurs have been given the almost exclusive use of billions—perhaps trillions—of dollars in radio spectrum. What I didn't yet mention was what, if anything, we're doing to be worth this enormous investment by our government. And it's just that—an investment. The FCC could start leasing out radio frequencies to the highest bidders. They might even be able to balance the federal budget that way.

Let's see. Let's take just a little bit, say our 160-meter band. 160m used to run from 1715–2050 kHz before WWII. If they extended the broadcast band by just 500 kHz, that would be fifty more 10-kHz channels—room for at least 2,500 more stations to operate. Have you any idea what the rights to use 2,500 radio channels are worth? Billions.

Okay—so we're each sitting on millions of dollars of valuable spectrum—how are we supposed to make this investment pay off for the country? Let's get out our rules and look at our franchise—it's right there in 97.1. That's where the FCC spells out what we have to do to warrant this enormous investment per user.

You should remember that the rules were written in 1935. Is it going to be a surprise to you that these rules are just a tad out of date? Hey, please don't mention this to the FCC—the last thing we need right now is to have them taking a look at our franchise in the light of 1987 realities. As long as the Commission is wrapped up in "more important" problems and forgets we're around, we're sailing free.

First—keep in mind the 1935 rules were written back when ten meters was still a VHF experimental band. Look back in your 1935 issues of *QST* and you'll see that ham pioneers were working to develop 10m communications technology. I well remember Fred Stevenson W1CUN, up in Bethlehem, New Hampshire, the first ham I ever met, as one of those ten-meter pioneers.

The microwaves weren't even imagined then. As I recall, the regulatory imagination stopped around 400 MHz. Beyond that was "up." Today our microwave bands are almost beyond calculation in value for satellite communications—and with so few exceptions they prove the rule, we're flat out not using 'em for anything. Worse, we don't even have any serious prospects for using 'em in mind.

There are five elements to our franchise—our responsibilities. Let's look at what we signed up for when we got our ham tickets and see how well we are measuring up to our agreement.

One—the amateur radio "service" is to provide a source of trained operators in time of war. Hmmm. Let's just think about that. When el biggo came along in 1941 we had about 50,000 licensed amateurs. I think you'll agree we lived up to our bargain when 40,000 joined the armed forces—80%. That obviously involved every available able-bodied ham who wasn't too young or too old.

> ***"These days I see a whole new life at HQ—an enthusiasm I never used to see. If you give HQ a live board, I think they'll blossom and we'll get amateur radio growing again."***

Those were simpler days, so our Morse-code skills were still of value. I even ran into an occasion when my ability to copy the code saved me and my submarine from being sunk. And I found my amateur radio technical knowledge of enormous value in learning how to use and repair Navy radio, sonar, radar, and test equipment.

I'm sure I was like many other hams in the armed forces, using my ham ingenuity at every opportunity. I rifled spare parts supplies on my submarine to build a radar alerting system to make sure I didn't miss any sudden targets. You see, sitting and watching a radar monitor for hours will stupefy anyone, and it takes only a couple minutes for a low-flying black-cat bomber to sneak in and blooie! So, just in case, it seemed to me worthwhile to have an alerting system in case an operator missed seeing a blip. Such a target indicator is common with radars these days, but was unknown then.

Also, I wanted to be able to keep track of what was going on, so I set up a monitor in my bunk in the After Battery so I could check the radar from there as well as when I was on duty in the conning tower.

We won that war with technology—by having better electronic scientists and engineers and enough technicians to operate and service all that gear. We're just now reading about some of the communications coups accomplished back then—breaking secret codes. As I've mentioned before, our radar superiority over the Japanese was of critical importance. My submarine was able to travel on the surface right down through the middle of well-protected Japanese troop convoys in the middle of the night, torpedoing ships left and right, with me keeping track of the course and speed of every escort warship, while they were unable to spot us.

Our electronic technology was so far ahead of the Japanese's during the war that the captain of my submarine had instructions not to let me be captured alive. That was a sobering reality of war which the other crew members took delight in reminding me of during our many depth-charge attacks.

Considering the enormous advances in electronic technology in Japan these days, we'd better make absolutely sure they are on our side from now on. They're leaving us hopelessly behind in many high-tech electronic development areas.

But let's just say that somehow the U.S. manages to get involved in a war. How valuable would we hams be to our military today as compared with 1941? Frankly, from what military equipment I've seen, 99% of us wouldn't have a clue. The few of us who can use the code would get the big laugh. Communications are all computerized now—most of it complete with automatic encoding and decoding for secrecy.

The few of us who have been fighting the miserable Loran pulses on 160m may not realize this system is hopelessly out of date. With satellites it's now possible for a car to find its way around city streets, located and guided with an accuracy of a few feet by computers.

I know of no interest on the part of the military to acquaint radio amateurs with their electronics and communications technology of today. So we haven't a clue as to what, if anything, we might do should there be a sudden need for technicians and operators. Frankly, I think we'd be ignored as useless—not just because such a high percentage of us are too old to be of use any more, but because most of us are hopelessly ignorant about modern technology.

In short, I don't believe we're even remotely honoring this part of our franchise as expressed in our rules.

Okay, there are four more responsibilities we're supposed to fulfill in order to be worthy of the trillions of dollars in frequencies we're hogging. Let's move on.

Number two—we're supposed to be a self-generating group. We're supposed to maintain and increase our ranks so we will be able to provide the operators and technicians for emergency military use. We're not doing that either.

Number three—we're supposed to keep on top of communications technology, and use our creative technological skills to invent and pioneer new modes of communications. Up until about twenty years ago we were doing very well with this. For instance, hams developed the sideband circuits which made SSB a practical possibility. We invented and pioneered narrowband FM, slow-scan television, invented most of the RTTY circuits, pioneered repeaters, and so on.

It was hams who built the SSB gear and demonstrated it to the Air Force and got them to accept this weird new communications mode. I remember well the antics of K2AAA, Art Collins WØCXX, General Curtis LeMay, General Butch Griswald, and Bill Grenfell

W4GF of the FCC back then. That's a great story and should be told before everyone involved dies.

To be told, too, should be the way Collins outfoxed General Electric and John Costas K2EN with his superior DSB system—great political maneuvering which cost GE hundreds of millions.

But, alas, what have we hams done in the last twenty years to pioneer new communications technologies? Packet is about it. When you consider the incredible number of potential new communications systems we could develop, obviously we're asleep. Between computers and microwaves, we have the technology right now to develop a communications system using satellites and repeaters which would enable us to deliver messages at 25,000 words per minute anywhere in the world in seconds—complete with automatic translation of the messages into any language.

The sad fact is that it takes younger technicians to build and pioneer these things and we haven't got 'em. Strike three.

Let's see—what else. Oh yes, we're supposed to provide a source of international goodwill. We're sure working hard on this one, with our DX pileups, harrassing DX stations for contacts and QSLs for DXCC, driving 'em off the air with endless contests, and so on. Tell me about international friendship. There is no way to have an uninterrupted contact with someone in a rare spot.

Now, last and least, we're supposed to help out in cases of emergency. We do this, but the communication we provide is so incredibly far from the state of the art that it's pitiful. We congratulate the hell out of ourselves for the magnificent work we do to help with earthquakes, storms, volcanos, and so on. And we do help. But compared to what we technically could do if our communications system wasn't about thirty years out of date, it's embarrassing.

The emergency communications networks we set up these days all use voice for message handling, thereby slowing down the throughput and introducing errors. Some 12% of the communications time is wasted with station and operator identification. 14% involves correcting errors or misunderstood communications. The increasing age of our operators has made it more difficult to find enough operators for serious emergencies—and those we do find are often not able to cope with hardship conditions. They tire quickly.

An objective look at our charter and our fulfillment of our responsibilities under that charter shows us woefully lacking. Mea culpa. Can we get ourselves straightened out before the FCC notices how badly we've dropped the ball? You bet we can—and it isn't all that difficult either.

The prime move for us is to bend our every effort at getting youngsters back into amateur radio. Raid the schools—get school clubs going no matter how difficult "educators" make it. Get your own youngsters to come to your local club meetings. If the meetings are dull and boring (which they are, and you know it), make sure they're made exciting. That means making big changes.

Now—technology. If you keep accepting the pap you've been putting up with in your ham magazines, that's just what you'll continue to get. Push the ham magazines to help you learn more about today's technology. Electronics is a ball—the more you know, the more opportunities will open for you to take advantage of your knowledge. And the opportunities are unlimited. We're going to see communications expanding by a factor of a thousand or more in the next few years—with or without us.

Are you on packet radio yet? What in the heck do you need, an enema? Get out your August *73* and read it this time. It's all there. Then get busy. Put together a packet unit and stop sitting around like a mental amputee. Some old fogies treat amateur radio as if it were golf—which is defined in some circles as a way to needlessly extend useless lives.

We're sitting on top of a gold mine—not just as a key to making money as communications systems expand—but in the sense that if we are true to our duty as outlined in our rules, we'll be getting youngsters into amateur radio. This will, in turn, launch them into high-tech careers, providing our country with the scientists, inventors, engineers, and technicians we desperately need to compete with Japan.

Now, are you going to spend the few remaining years of your ham life tying up a local repeater, saying almost nothing over and over, jamming up our more crowded bands during contests, making life miserable for your fellow DXers by adding to the pileups—or are we going to see you Elmering newcomers? Will I be hearing you making amateur radio a bit more fun for a Novice? Will you be working to get a school radio club going? Will you endow a *73* subscription for a local school library? Or will I be hearing you jamming the 40-meter service nets and stomping all over 80-meter DX stations trying to get through? Are you one of the hopelessly frustrated, doing everything you can to mess up the fun others are having, or are you working with kids and keeping up with the state of the art?

"Keep in mind the 1935 rules were written back when ten meters was still a VHF experimental band."

Well, damn! There goes that confounded Wayne Green spreading doom and gloom—and making you feel guilty about our hobby. Maybe—but is it me making you feel guilty or yourself? I'm only telling you things you really know already, but have been trying to ignore.

Oh yes, if you try to make any effort at all towards getting amateur radio growing, one thing you're going to find straight out is that I haven't been exaggerating one whit about the resistance you're going to find to the code. I warn you, if you don't have any honest answers for the kids on this, they're going to see through your baloney if you try and convince them the code has any validity these days. Don't you hate a smart kid? Well, they're smart and they don't buy baloney the way we did.

A no-code license? No problem here at all, as I've mentioned before. It's simple—as soon as the ARRL demands a no-code license from the FCC we'll have one. How do we do that? Simple again—you're the people who vote in the ARRL directors. If you want a no-code license—say for 220 MHz—just stop voting in directors who are opposed to it. What could be simpler? You vote in these blokes every two years, so if you really want a change it'll take you two years to do it. Period.

As long as you continue to vote in directors who would rather see amateur radio die than bend on no-code, even for 220 MHz, we're in deep do-do. Now—I don't think I've attacked the League or even said anything nasty. That certainly isn't my intention. I just want to mention again what was brought out so clearly at the Dayton ham industry meeting last year. One more thing—I'll bet you won't find anyone at ARRL HQ fighting you once you clean up the director mess you've made. I'm very impressed by the new HQ gang.

The League used to be run by a bunch of arrogant alcoholics who were very cynical about amateur radio. None were really hams at all—just bureaucrats keeping their jobs by having ham calls. These days I see a whole new life at HQ—an enthusiasm I never used to see—and I've known 'em all personally for over 35 years now. If you give HQ a live board, I think they'll blossom and we'll get amateur radio growing again.

The strength of the League, like the strength of amateur radio itself, lies in your interest—your strength. If you ignore director elections, you'll get just what you ask for—bureaucrats looking for power. If you ignore your duty as a ham, you'll see us continue to lose our hobby. Your personal involvement is needed—as an individual—as an active ham club member. The prize? I guarantee you'll find it frustrating beyond description—and rewarding beyond anything else you've ever undertaken. What a glorious sense of satisfaction there is in helping others get their ham tickets and then go on to become successful engineers and technicians.

EMP REVISITED

Six years ago the FCC's Defense Commissioner Mimi Dawson, with the support of Chairman Mark Fowler and Senator Goldwater, formed the Long Range Planning Committee (LRPC), with four National Industry Advisory Committees (NIAC) to assist it. The LRPC was made up of top executives in the communications industry, brought together to formulate an overall plan for emergency communications for our country.

The first step was to see what

had been done in the past to cope with emergencies—what systems were available and how they had worked. The next step was to look closely at all communications systems and their role in helping us cope with future emergencies. Emergencies encompassed everything from local problems due to accidents, fires, and floods—to regional emergencies due to earthquakes—right on up to the ultimate emergency: an atomic attack.

The LRPC soon had to face one fundamental fact: Only the amateur radio service had the potential for providing the needed communications. The military depended almost entirely on commercial telephone lines for their communications (95%)—and the first thing that seems to go out in any emergency is the telephone. Indeed, it was this which put the Alaskan military bases out of communications with the Pentagon for almost a week following the Alaskan earthquake. Their only communications were via hastily set up amateur radio networks.

The LRPC and the FCC then faced an extremely serious problem. If the only dependable emergency communications system that could tie together police, fire, towns, road crews; two-way services such as trucks, taxis, doctors; television remote units, CB, CAP, MARS, broadcast radio and TV, and so on was amateur radio, then we were going to need a substantial growth and modernization of this service. The traffic volumes estimated were several orders of magnitude beyond the capability of our present voice or CW communications systems. These volumes could only be handled by high-speed automated digital communications such as packet radio.

The LRPC and the Commission then tried to tackle the need for vastly more hams. The only ham system in the world that seemed to be working these days was the one adopted by the Japanese—a no-code license. Efforts to implement this here were completely stopped by the ARRL directors. In frustration, the FCC disbanded the LRPC and its NIAC committees last year—giving up on the whole emergency communications situation.

All this is the background—and, my apologies since I've covered it all before—but I find many ham memories seem to be incredibly short when it comes to the no-code debacle. A couple of hams have been pushing the FCC to deal with the problem of electromagnetic pulses (EMP) so the few amateurs we have left will be in a better position to provide emergency communications should an atomic bomb be used.

Little has been published on how we can cope with this problem. Indeed, we have little information on how much of a problem this really is! Some reports indicate that a high-altitude bomb might wipe out most solid-state equipment for a thousand miles around. Pffft would go all our HTs and mobile VHF gear—plus our low-band rigs—leaving us nothing with which to communicate. The Department of Defense (DOD) has been fighting to keep the FCC out of the EMP arena—saying there's plenty of information available on how to guard against EMP. The hams replied that the key information on this is classified—or, at best, apparently only available to large corporations.

Can ham gear be protected against EMP so we would have a chance to do our thing in case of an atomic bomb? Unless data is made available to help us shield and protect our ham stations—unless data is available to help manufacturers build in bypassing and shielding—the only backup communications our country has in case of such an emergency will be completely out of business.

"Unless data is made available to help us shield and protect our ham stations. . . the only backup communications our country has in case of such an emergency will be completely out of business."

Well, you say, the likelihood of an atomic attack is remote enough so all that is just the usual gloom and doom baloney. That's nothing I have to worry about anymore. Okay, let me repeat a bit of another recent editorial—backed up by the *Connections* program I saw last night on PBS. You have to be terribly out of touch not to know that atomic bombs are now portable enough to fit in a suitcase—per the illustration on *Connections*. So all that's necessary is for one terrorist group to grab enough nuclear material and guess where they're going to head, suitcase in hand?

Nuclear material comes from atomic power plants—where several recent reports have shown security often is pitiful. Plus we have nuclear sources now in more and more Third World countries. How much trouble would Kaddafi have getting enough for a bomb? The French seem eager to sell atomic energy equipment to virtually any country interested.

So it's more a question of when we're going to be faced with a nuclear terrorist than if. As I asked in my editorial—how ready is your club? If you're around New York or Washington, you'd better be very ready, with as hardened protection against EMP as possible—with as high-speed automated communications as the state of the art will allow. Depending on Morse code for communications, where we'll be the only service capable of replacing the telephone, is about as effective as planning to use smoke signals.

Not only are the military almost totally dependent upon telephones, so are virtually all other disaster groups. Civil Defense officials have almost universally given up even trying to use amateur radio links—too slow compared to picking up the telephone. Ham communication is slow, seriously prone to errors, and too dependent upon older men without the stamina needed.

I think you'll find the latest filing by the hams trying to get the FCC to face this situation of interest. Talk about fighting city hall!

Now, lest I be put down (now, *who* would do that?) for doom and gloom without solutions, the way to resolve this is to first get the FCC to help us find out how to cope with EMP—despite the unreasonable resistance of the DOD. Second, it's getting on to time to recognize our need for a million or so hams instead of more like the 250,000 we have today. Third, we need to urge the few technically competent hams we have—those who didn't Bash or bribe their way to Extra class—to start work on high-speed automatic digital communications systems—like packet, only much faster. We need to be able to provide million-message throughputs, not dozens—and our gear should be capable of being operated by anyone around who is still alive.

We have the technology to do all this—all we lack is the technicians and the guts to face the biggest challenge of our lives. Lacking this, my suggestion is to move as far away from New York or Washington as you can—and soon! Living near those death traps could be more harmful than smoking—or even Southern California and its coming humdinger earthquake. ■

JANUARY 28 REPLY COMMENTS OF DONALD J. SCHELLHARDT AND NICKOLAUS E. LEGGETT TO COMMENTS FILED BY THE DEPARTMENT OF DEFENSE

We, the undersigned, hereby file Reply Comments in response to the January 21, 1987 Comments of the Department of Defense (DOD), which were filed in opposition to our January 5, 1987 Petition for Reconsideration in Docket No. RM-5528. In filing these Reply Comments to DOD, we expressly reserve our right to file further Reply Comments in response to possible future filings in this Docket by other interested parties besides DOD.

Overall Assessment of DOD's Comments

In general, the DOD filing fits into the classic pattern of debate in this Docket so far. One side of the debate says, in essence: "We've started to look into the EMP issue. We have a plan of action, even though virtually nothing about it is available to the general public, and at some point down the road you will see some results. Trust us." We continue to ask: "If action is on the way, then who is going to do what by what date? Who is going to review the work product with an eye to the public interest? And, if DOD and the telecommunications companies are really committed to action, why are they hiding behind a wall of secrecy? Why won't they let the general public look at the NSTAC study and other details of the plan of action that supposedly exists? Why do they resist public input? If there's really action underway, why are they stonewalling?"

Because this ground of debate is well trodden by now, our overall assessment is that DOD's filing says very little which has not already been said in GTE's September 11, 1986 Comments, or in the December 12, 1986 decision by the Federal Communications Commission staff, or in both documents. Due to this reiteration of key points made in other documents, most of DOD's contentions have already been addressed by us, either in our September 24, 1986 Reply Comments to GTE, or in our Petition for Reconsideration. A few of the points were even addressed in our initial July 30, 1986 Petition for Notice of Inquiry.

We will not burden the Commission with a lengthy reiteration of points we have already made in previous filings. Instead, we will focus upon those points raised by DOD which add something new to the established record.

Responses To New Points Raised By DOD

1. On page 2 of its filing, DOD states that "While there is no dearth of information regarding EMP, as the petitioners state (Petition for Reconsideration, pp. 3–4), there is also much contention regarding the impact of EMP."

To the best of our knowledge, this is not the case. In our review of the technical literature on EMP, there appears to be two solid points of consensus: 1) that shielding and bypassing, and other protective measures, can be dramatically effective in reducing or eliminating vulnerability to EMP; and 2) that unprotected solid state equipment is extremely vulnerable to EMP.

While it is true that one can find differing technical opinions on the exact *degree* of vulnerability to EMP, the technical literature displays little—if any—disagreement over the *fact* of high vulnerability to EMP.

In short, we seem to have a disagreement with DOD over what the facts are. To buttress our own assessment in this factual dispute, we have submitted to the Commission the abstracts of literally hundreds of government-sponsored studies on EMP. We will let these studies "speak for themselves" as the Commission reviews them. DOD, however, has simply made the flat statement we quoted and then implied that classified material *might* support its assertion. If DOD has evidence to support its contention, then DOD has a duty to bring that evidence forth—in a form that would not jeopardize national security. Indeed, the Notice of Inquiry that we have requested would be a perfect national forum for putting all of the evidence before the Commission—our evidence, DOD's evidence, GTE's evidence, everyone's evidence—and then letting the Commission decide what the facts are, with the benefit of review and participation by *all* interested parties.

2. Speaking of the need to make evidence publicly available, we note that DOD mentions—as one of the "core" constructive actions on EMP protection—preparation of a study on EMP by the President's National Security Telecommunications Advisory Committee (NSTAC). According to the previously referenced GTE Comments, which quoted from this study, it was this NSTAC document which triggered ongoing efforts to develop EMP equipment protection standards through the American National Standards Institute (ANSI).

Strangely, this NSTAC study—which plainly plays a crucial role in guiding current EMP protection efforts—is not available to the general public. Instead, Louis Slessin, Editor of *Microwave News* in New York City, has had to file a Freedom of Information Act request in his pursuit of a copy, and at present his request (dated September 28, 1986) is still "under consideration."

Actually, it is not precisely correct to say that the NSTAC study is publicly unavailable; it would be more accurate to say that the document is *selectively* unavailable. After all, GTE was able to quote from the NSTAC study in its Comments. Thus, attorneys for large telecommunications companies can apparently obtain a copy—but members of the press cannot.

In short, when it comes to the development of EMP protection measures, DOD and GTE seem to want a game where everyone can play except the general public.

Playing the game in this manner produces results that the architects of our Republic can hardly have intended. Here we are as private citizens, exercising our Constitutional and statutory rights to petition our government for a "redress of grievances," and we are told that the action we request is unnecessary due to plans set forth in a NSTAC document that we are not even allowed to see because we are merely members of the general public. Why must we private citizens "debate in the dark" and find ourselves excluded from the decision-making process?

Now DOD and GTE are asking the Commission to perpetuate a public policy development process that is hermetically sealed against the public it is supposed to serve. If the Commission agrees, it will be departing from the democratic spirit that is America's heritage. It will also be departing from its own statutory obligations.

3. On page 3 of its filing, DOD maintains that "To address EMP issues in a formal regulatory proceeding will only slow down, and could hamper, ongoing EMP mitigation efforts."

We can imagine situations where this might be the case. For example, let us assume that the NSTAC/ANSI participants were *committed* to developing a definite work product, by a *date certain* in the reasonable future, with at least some Commission review of the work product to assure that the public interest has been protected. Under such circumstances, injection of regulatory proceedings could conceivably interrupt ongoing progress (although we would still face the problem that the NSTAC/ANSI group's narrow focus on telephones excludes action on such vital communications equipment as radios, television sets, and communications satellites).

Such a set of circumstances remains hypothetical—at least at this time. Instead of a firm commitment to action, tangibly reflected in *deadlines* for specific accomplishments, we have a vague promise of possible results, of an unspecified nature, at an unspecified time. Indeed, of the DOD filing's four cited examples of ongoing action, one example involves equipment testing, one involves the NSTAC study, and two involve equipment protection standards that are still under development. None of the examples has yielded as yet a tangible, measurable change in the vulnerability of working equipment in the real world. Under such conditions, regulatory proceedings would not be interrupting action; they would be serving the cause of effective action by alerting key parties that vague promises are not enough.

4. On page 2 of its filing, DOD makes the following statement: "Moreover, because the Department of Defense relies upon commercial telecommunications suppliers (i.e., civilian communication systems) for over 95% of its telecommunications services within the United States, significant effort has been made in the EMP area."

DOD makes this point in an attempt to rebut our concern that efforts to protect military communications equipment have tended to overlook the need to protect civilian communications equipment. If we understand DOD correctly, it is saying that the two are largely inseparable—that DOD has an incentive to protect civilian communications systems, as well as purely military systems, because purely military systems carry only a tiny fraction of the military's actual communications traffic.

This point cuts both ways, however. If the military relies on civilian communications systems for 95% of its traffic, then the nation's *military* operations—not "just" its economic activities—would be placed in grave jeopardy if an EMP strike occurred under current conditions.

In this regard, it is interesting to see that the DOD filing is made on behalf of the Secretary of Defense "in his capacity as Executive Agent for the National Communications System." This same National Communications System has issued a detailed report on EMP. The report, entitled "Electromagnetic Pulse/Transient Threat Testing of Protection Devices for Amateur/Military Affiliate Radio System Equipment" (NCS TIB 85-10), is fortunately available to the public. It mentions, among many other conclusions, that older civilian telephone equipment is relatively resistant to EMP—but is generally being replaced by solid state equipment that is highly vulnerable to EMP. A condensed version of part of this report was published in the August 1986 edition of *QST* magazine, and was formally submitted to this Commission as Exhibit II of the GTE Comments. On page 20 of the magazine, the article states that "The commercial telephone system consists, in large part, of unshielded telephone switches and cable systems . . . In recent years, the telephone companies have started using solid-state switching systems that could be highly sensitive to EMP."

In short, it appears that the military has in large part tied itself to the civilian communications system. In the words of an agency for which the Secretary of Defense is "Executive Agent," this civilian communications system "could be highly sensitive to EMP."

By clear implication, our nation's military must be in the same boat.

On balance, then, the information supplied by DOD strengthens the case for actions on civilian communications systems. Because military communications and civilian communications are so intermingled, it now appears that an EMP strike might devastate more than "just" the nation's economy.

This point should not be lost on a Commission whose statutory charter explicitly mentions protection of the national defense as one of the Commission's duties.

Conclusion

For the reasons set forth in this filing and in our previous filings, we urge the Commission to grant our Petition for Reconsideration and to proceed expeditiously with a Notice of Inquiry on the crucial subject of Electromagnetic Pulse.

Donald J. Schellhardt
Nickolaus E. Leggett

Tech Talk from ICOM

ICOM

Performance, Reliability, and Customer Support: The Winning Team

While attractive front panels and impressive magazine advertisements may initially glamorize any amateur radio item, they can also reflect the classic proverb of beauty being only skin deep. The favorable returns from any unit and the success of its manufacturer, however, are directly influenced by **after-purchase reliability and factory-backed service.** Knowledge of such performance records and readily available customer support encourage the peace of mind to use and enjoy a new unit to its maximum potential.

ICOM considers the aspect of service from two interrelated standpoints: daily in-field use and possible "down the line" repairs if, and when, needed. This concept is pursued by first building **professional communications quality and reliability into every unit,** confidently backing it with a full warranty, then substantiating that dependability with **uncompromised factory authorized service and customer support.** All ICOM HF transceivers and shortwave receivers reflect that philosophy with their **full one-year warranties**...and service centers that are not bottlenecked with backlogs (stout performers simply give less trouble). ICOM isn't playing down customer support, but building a positive long-term reputation on it!

Today's era of advanced technology and seemingly endless consumers tends to replace old-time "concerned treatment" with attitudes of "being one of a vast number in line." Returning a unit for adjustment or repair and later attempting to check its status sometimes proves to be a frustrating experience. While no one is infallible, ICOM honestly strives to avoid an attitude of "too many customers to provide congenial service." ICOM's customer service **hotline** at (206) 454-7619, for example, will put you directly in touch with the main service department. The only prerequisite is **mutual understanding** in sharing this resource so everyone can have queries answered and radios repaired. If a problem can't be alleviated via telephone, ICOM strives for a service center "turnaround time" of three to five days.

Continuing that customer support, **ICOM is the only amateur radio company with four factory-owned service centers in North America.** The centers are located in Atlanta, Georgia; Dallas, Texas; Bellevue, Washington; and Vancouver, British Columbia. Most ICOM service centers are also situated near major airports to further minimize transportation problems.

The amateur radio industry is ICOM's major interest; it's not a sideline or spin-off of other pursuits. ICOM doesn't manufacture stereos, VCRs, or televisions. ICOM is communications industry oriented with secondary involvement in top quality marine, land mobile, and avionics equipment.

The stouthearted reliability of ICOM equipment is continuously praised in testimonial letters from proud owners. A few samples from those "believe it or not" files include stories of transceivers literally drowned in salt water two or three hours, yet continuing to operate flawlessly...of no failures to date in the IC-735 and IC-751 power amplifiers...of handheld transceivers dropped from towers, and one was even run over by a truck(!), yet continued to operate after outer case repairs (fortunately, ICOM handhelds include a separate metal frame to protect PC boards and a high impact plastic "outer case").

The next time you switch on a deluxe HF transceiver, compact VHF mobile rig or handheld FM unit, pause a couple of seconds and think about its less apparent aspect of customer support and service. Who would you call if a problem arose, what would be their attitude, and approximately how long might you anticipate being off the air? If you're a proud ICOM owner, those answers are reassuring rather than aggravating.

Again, ICOM's dedication to top performance, exceptional reliability and unsurpassed customer support may not be visible on a front panel or in a colorful ad, but they're **included in every ICOM item.** ICOM equipment is simple to use and the best in quality. It's "Simply the Best" and an increasing number of amateurs are proving that statement in their setups every day. Isn't it time you, too, joined the ICOM winning team?

ICOM America, Inc., 2380-116th Ave. NE, Bellevue, WA, 98004 **Customer Service Hotline (206) 454-7619**
3150 Premier Drive, Suite 126, Irving, TX 75063 / 1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

BARTER 'N' BUY

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 60-page catalog, $3. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90815. BNB045

MARINE RADIO: Marconi Canada CH-125 synthesized AM/SSB transceiver, 22 channels on 4, 8, and 12 MHz, 125 Watts, 12 V dc. Never used, list $1,995, asking $1,495. Stu Norwood, 70 Rte. 202 North, Peterborough NH 03458. BNB047

QSLs to order. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

THE DX'ERS MAGAZINE. Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD. DXCC Honor Roll Certificate 2-4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

IMRA—International Mission Radio Association. Forty countries, 800 members. Assists missionaries with equipment loaned, weekday net. 14.280 MHz, 2–3 p.m. Eastern. Brother Bernard Frey, 1 Pryer Manor Road, Larchmont NY 10538. BNB326

RADIO TRANSCRIPTION DISCS WANTED. Any size, speed. W7FIZ—WG, Box 724, Redmond WA 98073-0724. BNB347

XEROX MEMORYWRITER—parts, assemblies, boards, manuals, Free help with service problems. W6NTH, Box 250, Benton AR 72015; (501)-776-0920. BNB404

HAM TRADER YELLOW SHEETS, in *our* 24th year. Buy, swap, sell ham-radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. $12 for one year (24 issues). PO Box 2057, Glen Ellyn IL 60138-2057. BNB412

QSL CARDS—Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, Dept. A, 310 Commercial, Emporia KS 66801. BNB434

YAESU OWNERS—Hundreds of modifications and improvements for your rig. Select the best from 14 years of genuine top-rated Fox-Tango Newsletters by using our new 32-page Cumulative Index. Only $5 postpaid (cash or check) with $4 rebate certificate creditable toward newsletter purchases. Includes famous Fox-Tango Filter and Accessories Lists. Milt Lowens N4ML (Editor), Box 15944, W. Palm Beach FL 33416; (305)-683-9587. BNB448

TOWER CLIMBING SAFETY BELTS and accessories. Free specs. Avatar Magnets W9JVF, 1147 N. Emerson #7, Indianapolis IN 46219-2929. BNB458

FIND OUT what else you can hear on your general-coverage transceiver or receiver. Join a shortwave radio listening club. Complete information on major North American clubs and sample newsletter $1. Association of North American Radio Clubs, PO Box 462, Northfield MN 55057. BNB464

"HAMLOG" COMPUTER programs. 17 modules auto-logs, sorts 7-band WAS/DXCC. Full-feature editing. Apple $14.95, IBM or CP/M $24.95. Much more. KA1AWH, PO Box 2015, Peabody MA 01960. BNB467

WANTED: Old Western Electric, RCA, Telefunken, McIntosh, Marantz, Dynaco, Tannoy, Altec—tubes, amplifiers, speakers. Maury Corb, 11122 Atwell, Houston TX 77096; (713)-728-4343. BNB479

Barter 'N' Buy advertising must pertain to ham radio products or services.

☐ **Individual (noncommercial)** .... **25¢ per word**

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No discounts or commissions are available. Copy must be received in *Peterborough by the fifth of the second month preceding the cover date.* Make checks payable to *73* Magazine and send to: **Hope Currier, 73 Magazine, WGE Center, Peterborough NH 03458.**

LEARN CODE on your IBM PC (or compatible), Commodore C-64/128, or Macintosh. CODE-PRO takes you from no knowledge to proficient copy. Specify computer. $10 plus $2 s&h. Trio Technology, Dept. 861, PO Box 402, Palm Bay FL 32906. BNB490

POST CARD QSL KIT—Converts post cards, photos to QSLs! Stamp brings circular. K-K Labels, PO Box 412, Troy NY 12181-0412. BNB498

CITIZEN BAND OPERATORS! Join the newest club around. Club benefits include power and modulation mods, a CB trader sheet, official number, CBs and accessories at discounted prices. Send $2 for information and postage to CB Operators of America, Attn: W. Thomas, 11 Collin Avenue, Uniontown PA 15401. BNB503

WANTED: EQUIPMENT AND RELATED ITEMS. The Radio Club of Junior High School 22 NYC, Inc., is a nonprofit organization, granted 501(c) (3) status by the IRS, incorporated under the laws of the state of New York with the goal of using the theme of ham radio to further and enhance the education of young people. Your property donation would be greatly appreciated and acknowledged with a receipt for your tax deductible donation. Please contact WB2JKJ through the *Callbook* or telephone (516)-674-4072, 24 hours, seven days a week. Thank you! BNB506

APPLE II+/c/e MORSE CODE PROGRAM. Menus, 31 modes, lesson plans, graphics, word processor, 1–100 wpm, etc. Write LARESCO, PO Box 2018, 1200 Ring Road, Calumet City IL 60409; (312)-891-3279. BNB507

HOME-BREW PROJECTS LIST. SASE WB2EUF, PO Box 708, East Hampton NY 11937. BNB509

SATELLITE SYSTEMS DISCOUNT CATALOG—$2 (refundable). Orion Descrambling Manual—$19.95. LSASE—brochure. Microtronics, PO Box 2517-BB, Covina CA 91722. BNB513

LEARN MORSE CODE IN 1 HOUR. Amazing new easy technique. Money-back guarantee. $10. BAHR, Dept. 73, 2549 Temple, Palmbay FL 32905. BNB517

ROTATING TOWER SYSTEMS, INC—Offers complete hardware systems to rotate 45 and 55 tower. Write or call for further details and prices. Box 44, Prosper TX 75078; (214)-347-2560. BNB520

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. Money-back guarantee. $10. Bahr, Dept. 73, 2549 Temple, Palmbay FL 32905. BNB522

DX AWARDS. Need info on any DX awards, especially lesser known ones. Check incoming cards for stickers or award notices. Directory planned for mid-1987. Ted Melinosky K2BV, 525 Foster Street, South Windsor CT 06074. BNB526

TRS-80 4P/KANTRONICS UTU RTTY. Split-screen, 10 user keys, file transfer. Runs in Mod 4 (80 char.) mode. $30 to COMMPRO RTTY, c/o KB6IC, 3711 Gayle Avenue, Omaha NE 68123. BNB527

COMMODORE CUSTOM/PROPRIETARY CHIPS or complete repairs for Commodore 64 etc. at low prices, 24-hour turnaround: 6510—$9.95, 6526—$9.95, 6581—$12.85, 6567—$14.50, 82S100PLA—$12, 8701—$7.25, and many others. Ask us about quantity price. Just released from Australia, "The Commodore Diagnostician." A laminated chart and cross-reference guide for fixing your own computer. C-64 Power Supply at $29.95. Call toll free (800)-642-7634 (outside NY) or (914)-356-3131; Kasara Microsystems, Inc., 33 Murray Hill Drive, Spring Valley NY 10977. BNB529

DE FOREST AUDION UV nickel base, $1,500 plus shipping, certified funds. John Brolley, 1225 Los Pueblos, Los Alamos NM 87544. BNB530

REAL-TIME HF WEFAX MAPS on a dot-matrix printer. Available for Commodore, IBM, Apple, Atari, and CoCo. See March 86 *QST* Magazine for circuit details. Kit $28.15. Assembled $39.95. Software—Apple, Atari, and Commodore $10. IBM—$15 plus $2.50 shipping. For info, send large SASE. A & A Engineering, 2521 W. La Palma #K, Anaheim CA 92801; (714)-952-2114. BNB531

QSLs, QSLs, RUSPRINT QSLs. Quantities of 100, 200, 300, or more. Full color Old Glory and Liberty. Also Parchment, Golden Eagle, and others. SASE appreciated. Rte. 1, Box 363-73, Spring Hill KS 66083. BNB532

SINCLAIR ON PACKET? COMLINK I makes it easy. Free info. A. Eckhardt, 918 Anna Street, Boalsburg PA 16827. BNB533

COLOR SSTV—For sale, Robot 400C slow-scan color transceiver and Robot 800C multi-mode keyboard. Both mint condition, like new. Asking $650 for both. Call after 5 p.m. to (601)-843-6405 or write to Don Durel N5ICQ, 700 Farmer Street, Cleveland MS 38732. BNB539

SHOW IT IN STYLE—Full color QSLs by Smith Printing. From your prints/slides. Sample packet. SASE. 20420 Calhaven Drive, Saugus CA 91350; (805)-251-7211. BNB540

YOUR TICKET OR UPGRADE via computer. Complete Novice course—*theory, code, QSOs, more. Complete* code course—Novice, General, Extra. For IBM, Radio Shack, Commodore. Also great for examiners. SASE for

details: JERLS, Incorporated, PO Box 1193S, Bedford VA 24523. BNB541

ANTIQUE RADIOS, schematics, tubes, and literature. Send SASE to VRS(ST), 376 Cilley Road, Manchester NH 03103 for large list. BNB542

WANTED: Yaesu YO-901 band scope adapter. Pete Haas, PO Box 702, Kent OH 44240. BNB543

KENWOOD 430S OWNERS: Stop Scan automatically resumes the scan *after* the channel clears! No mods! No cut traces! Reviewed in *QST* 6/85 and *73* 2/85. $29.95 (kit $19.95). Jabco Electronics, R1 Box 386, Alexandria IN 46001. BNB544

VOICEGATE NOISE REDUCTION. Studio technology eliminates background QRN! Features gated audio, dynamic expansion, 2 notch filters 1 bandpass, cassette remote control, and more! SASE for free pamphlet or include $3.50 for our demonstration cassette! $99.95. Jabco Electronics, R1 Box 386, Alexandria IN 46001. BNB545

ATARI FIELD DAY dup program for the 800, 800XL, and 130 XE. Checks dupes and bad calls. Deletes calls, lists calls, printouts for Epson printers, either alphabetically or suffix alphabetically. Covers all bands, all call areas. Double-sided disk $10. Vern Smith WA1OEH, Box 20, E. Thompson Road, Thompson CT 06277. BNB546

QSL CARDS. Choose from 6 beautiful new designs or custom printed from your art. Write for free samples. Sandollar Press, PO Box 30726, Santa Barbara CA 93130. BNB547

SAVE $1.50 SHIPPING on 87-88 ARRL *Repeater Directory*. Send $5 total. All ARRL titles available for book price plus $1 shipping. Marshall Hill Enterprises, Inc., Marshall Hill, Bradford NH 03221. BNB548

COMMUNICATIONS SOFTWARE. Predict range in miles based on xmtr, rcvr, and antenna parameters. $15 disk contains HF/VHF/UHF/L-BAND propagation programs plus Smith Chart impedance matching. Specify Commodore 64 or MS-DOS BASICA. Lynn Gerig WA9GFR, 6417 Morgan Road, Monroeville IN 46773. BNB549

NEED FIVE-DAY CRASH COURSE to pass 13-wpm code test. Test must be given and passed at end of course. Name fee. Prefer east of Mississippi, but will go anywhere. Respond to Bob Herron, 3312 Jude Cr., Murrysville PA 15668. BNB550

FOR SALE: Brand new Ten-Tec 2510 satellite station, $400. Jim N1EJF, PO Box 1101, Hillsboro NH 03244; (603)-478-3262. BNB551

WANTED: Azden PCS-3000 2-meter FM transceiver, any condition. Adlai Breger, 8006 Dove Flight, San Antonio TX 78250; (512)-523-5438. BNB552

WANTED: Service manual for Yaesu FTX-650. Will pay for copying and postage. Jim Lisle WA4WQK, 3227 Park Avenue, Columbus GA 31904. BNB553

THE COMMUNICATION POST: Buy, sell, trade—ham, shortwave, and other electronic gear. Technical articles, projects. Send large SASE for sample copy. 24 issues, $9.95 per year. Box 1771 Grand Forks ND 58206-1771. BNB554

VHS VIDEO CASSETTES. $29.95 total price for a box of 10 delivered anywhere in continental U.S. Call for 24-hour order info. KB6MT (714)-990-9622. BNB555

"COMMODORE C-128" specific ham programs. SATRAK128 tracks up to 8 satellites simultaneously in real-time. C128RTTY RTTY program for user port RTTY (example, MFJ-1228) devices. Send SASE for additional information on above to: Reid Bristor WA4UPD, 14303 177th Avenue SE, Renton WA 98056. Phone (206)-235-0676. BNB556

FACTORY FRESH NiCds. Save this ad. AA/$1.45 each, AAA/$1.45 each, 2N 270AA (replaces 2N 250AA used in ICOM 2AT/4AT BP3 packs) $1.85 each, BP3 pack of 7 wired for your case $14.95 each, 2N 450A (used in ICOM BP2/BP5, Tempo S4, Yaesu FT-207R/208R) $2.40 each. Add $2 S&H/order. Cunard Associates, R.D. 6, Box 104, Bedford PA 15522. BNB557

HAM RADIO REPAIR, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128; (408)-729-8200. BNB558

SPECIAL EVENTS

HOLIDAY-IN-DIXIE QSO PARTY
APR 4

The Holiday-in-Dixie QSO Party will operate on April 4 from 1800–2300 UTC during the Holiday-in-Dixie Celebration, an annual 10-day event commemorating the Louisiana Purchase, which is held in Shreveport and Bossier City, Louisiana. Exchange: Name, QTH, and RS(T). Frequencies: SSB—7.235 and 14.245; CW—7.115 and 21.115 (listen for CQ HID). For an 8-1/2 x 11 certificate, send an SASE and QSL to Holiday-in-Dixie QSO Party, c/o WA5ARJ, PO Box 4842, Shreveport LA 71134.

ROCHESTER MN
APR 4

The Rochester ARC will sponsor the 10th annual Rochester Area Hamfest on April 4, beginning at 8:30 a.m., at John Adams Junior High School, 1525 NW 31st Street, Rochester, Minnesota. Talk-in on 146.22/.82. For further information, write to RARC, c/o WB0YEE, 2253 Nordic Center NW, Rochester MN 55901.

COLUMBUS IN
APR 4

The Columbus ARC will hold its Swapfest '87 on April 4, from 8 a.m. to 5 p.m., at the 4-H Fairgrounds, in Columbus, Indiana. Admission is $3. 8-foot table, $4; 6-foot table, $3. Talk-in on 146.790 and 444.950. FCC testing held at Knights Inn Motel. Send Form 610 and copy of license ten days in advance to Til Kinser KI9R, 6651 N. Road 110 W., Columbus IN 47203; (812)-372-5006. For tables or information, contact Dave Mann KA9UUP, 458 N. Country Club Road, Columbus IN 47201; (812)-342-6302.

ARCADE TRADE FAIR
APR 4–5

The Pioneer Radio Operators Society (PROS) will operate KC2JY on April 4–5, from 1400–2200 UTC, for the 4th annual Arcade Trade Fair. Operation will be on SSB with suggested frequencies 3.890, 7.240, and 14.250. For a QSL, send a QSL and an SASE to PROS—KC2JY, Box 296, Arcade NY 14009.

WILLINGBORO NJ
APR 5

The Willingboro Repeater Group will hold its annual hamfest on April 5, from 8 a.m. to 2 p.m., at Holiday Lakes, Rte. 130 and Creek Road, Willingboro, New Jersey. Admission is $3 at the door or $2.50 in advance, XYLs and children under 16 free. Table space: $5 per 8-foot table. Tailgaters must purchase an admission ticket, outdoor selling only. Talk-in on 146.925 or 146.52. For further information, write to Willingboro Area Repeater Group, PO Box 472, Willingboro NJ 08046, or call Jack K2KLM at (609)-877-5249 after 6 p.m.

GROSSE POINTE WOODS MI
APR 5

The South Eastern Michigan ARA will hold its 29th annual Hamfest Swap and Shop on April 5, from 8 a.m. until 3 p.m., at the Grosse Pointe North High School, 707 Vernier Road, Grosse Pointe Woods, Michigan. Advance tickets $1, $3 at the door. Advance tables $8, $10 at the door. Talk-in on 147.70/.10 and 146.52. For more information, write to SEMARA Hamfest, PO Box 646, St. Clair Shores MI 48080, or phone Fred Lewis NK8M at (313)-881-0187.

FRAMINGHAM MA
APR 5

The Framingham ARA will hold its annual spring flea market and exams on April 5, beginning at 10 a.m., at the Framingham Civic League Bldg., 214 Concord Street (Rte. 126), in downtown Framingham, Massachusetts. Admission is $2 and tables are $10 (includes one free admission). Pre-registration is required for tables and exams. Talk-in on .75/.15. To reserve tables, contact Jon Weiner K1VVC, 52 Overlook Drive, Framingham MA 01701; (617)-877-7166. To register for license exams, send completed Form 610, copy of ham license, and check for $4.25 payable to ARRL/VEC to FARA, PO Box 3005, Framingham MA 01701. Walk-in exams given on a space-available basis.

MADISON WI
APR 5

The Madison Area Repeater Association, Inc., will hold its 15th annual Madison Swapfest on April 5, beginning at 8 a.m., at the Dane County Exposition Center Forum Building in Madison, Wisconsin. Admission is $2.50 in advance and $3 at the door. Children 12 and under are admitted free. Tables are $5 each in advance and $6 at the door, plus admission. Reserve by March 31. Talk-in on 146.16/.76. For admission tickets, table reservations, or information on commercial exhibit space, contact MARA, PO Box 3403, Madison WI 53704; (608)-274-5153.

CHARLESTON WV
APR 5

The Charleston WV Area Hamfest & Computer Show will be held on April 5, from 8 a.m. to 5 p.m., at the Civic Center in Charleston, West Virginia (follow I-64, I-77, and I-79 to exits marked "To Civic Center"). Admission is $4. Talk-in on 6.28/6.88. For more information, contact Ollie Rinehart KA8TIK, 1256 Ridge Drive, South Charleston WV 25303; (304)-768-9534 (days) or (304)-768-9534 (nights).

LANCASTER PA
APR 5

The 14th Lancaster Hamfest, sponsored by Sercom, Inc., will be held on April 5, from 8 a.m. to 2 p.m. at the Overlook Roller Rink (on Rte. 501 just one mile north of the Rte. 30/501 intersection, two miles north of Lancaster, Pennsylvania). $4 admission, XYLs free. $5 per space for tailgating. Tables $10, perimeter or with electricity $12. Talk-in on 146.01/.61 or 147.015/.615. SASE to Hamfest Committee, PO Box 6082, Lancaster PA 17603 for info.

CLARKSVILLE TN
APR 5

The Clarksville Amateur Transmitting Society will sponsor its annual

Swapfest at the National Guard Armory on Hwy. 41A (Ft. Campbell Blvd.) in Clarksville, Tennessee, on April 5. The armory is off I-24, three miles south of Gate 1 to Fort Campbell. Admission is free. Tables are $5 each. Talk-in on 146.52, 146.805/.205, or packet 145.03. To reserve tables or to get more information, call Larry WD4DBJ at (615)-232-6141.

OMAHA NE
APR 5

The Ak-Sar-Ben ARC will present its annual auction on April 5 at The Radial Social Hall, 1516 N.W. Radial Highway, Omaha, Nebraska. Check-in starts at 8 a.m., auction at 9:15. No admission fee. Talk-in on 146.34/.94. For rules or more info, write Ak-Sar-Ben ARC, PO Box 291, Omaha NE 68101, Attn: Auction Chairman.

MOORELAND OK
APR 5

The Great Plains ARC 6th annual Northwest Oklahoma Eyeball and Swapmeet will be held in Mooreland on April 5, starting at 9 a.m. $2 admission at the door. Dealer and swap tables available at no charge. Talk-in on 147.72/.12, 146.13/.73, and 146.52. VE tests given on April 4. Directions: North on Main or Elm Street, across the tracks and west. For further information, call (405)-994-5600 or write to Gerald Bowman WG5Z, Box 356, Mooreland OK 73852.

APPALACHIAN TRAIL
APR 10–12

The Lanierland ARC will operate W4IKW from 1400 UTC on April 10 until 0200 UTC on April 11, and also from 1400 UTC on April 11 until 0200 UTC on April 12 at Amicalola Falls State Park to honor the 50th anniversary of the completing of the Appalachian Trail, a 2,000-mile hiking trail from Springer Mt. in Georgia to Mt. Katahdin in Maine. The suggested operating frequencies ±QRM are 14.270, 7.270, and 3.870 on the General phone bands, and 7.140 and 3.740 on the Novice bands. Listen for CQ ATC on all bands. For a commemorative certificate, send QSL and a 9 x 12 SASE to Lanierland ARC, PO Box 2182, Gainesville GA 30503.

ST. CHARLES MO
APR 11

The St. Charles ARC will operate WB0HSI from 1400–2200 UTC on April 11 to celebrate its fifteenth anniversary near its original meeting place. This special-event station will transmit on 7.250, 14.325, 21.350, 28.510, and 146.67 as propagation and QRM permit. For a certificate, send a large SASE to the St. Charles ARC, PO Box 1429, St. Charles MO 63302-1429.

SUBMARINE SERVICE ANNIVERSARY
APR 11–12

The Olympia RAC will celebrate the anniversary of the United States Submarine Service by operating station WA3BAT from the *U.S.S. Becuna*, a World War II submarine and the *U.S.S. Olympia*, flagship of Admiral Dewey in 1898. Transmissions can be heard beginning al 1300 UTC on April 11 until 2000 UTC on April 12. CW frequencies will be 3.590, 7.050, 14.050, 21.090, and 28.150. Phone frequencies will be 3.890, 7.240, 21.360, and 28.600 (all frequencies within 10 kHz). Two-meter operation is planned as well as Novice bands. For a certificate and additional information, send a business-sized SASE (U.S.) or one IRC (foreign) to Olympia Radio Amateur Club, PO Box 928, Philadelphia PA 19105.

PA MAPLE FESTIVAL 40TH
APR 11–12

The Somerset County, Pennsylvania, ARC will operate KA3IUS on the lower 25 kHz of the General section of 75 and 40 meters on April 11 and 12 to commemorate the 40th anniversary of the Pennsylvania Maple Festival. On April 11 from 1700–2200 UTC on 40 meters, then from 2200 to ? on 75 meters. On April 12, from 1700–2200 UTC on 40 meters. Please send an SASE for a certificate to KA3IUS, R.D. #1, Box 394-B, Meyersdale PA 15552.

BRAINTREE MA
APR 12

The South Shore ARC will hold its annual indoor flea market on April 12, from 11 a.m. to 4 p.m., at the Viking Club, 410 Quincy Avenue, Braintree, Massachusetts. Admission is $1. 8-foot tables available for $10 each (includes one free admission per table) in advance. Send payment (made out to South Shore Amateur Radio Club) to Ed Doherty W1MPT, 236 Wildwood Avenue, Braintree MA 02184 before April 9. Tables will cost $12 on the day of the sale. If you have questions, call Ed at (617)-843-4431 during the evenings.

AUSTIN TX
APR 18

The Austin ARC will sponsor its Spring Swapfest on April 18, beginning at 7 a.m., at the Manchaca fire station on FM1626, south of Austin, Texas. Free admission. Tables, $2. Talk-in on 146.18/.78. For info, contact Dave Harper WD5N, 109 West 38 Street, Austin TX 78705; (512)-454-9205 (evenings).

ARBOR DAY
APR 20–26

Special-event stations will be operating from 2400 UTC April 20 to 0600 UTC April 26 from Nebraska City, Nebraska, the home of Mr. J. Sterling Morton, the founder of Arbor Day. Stations will be operating in the General portion of the phone and CW bands on 80 through 10 meters. SWLs can participate also. Please send a business-size SASE and your QSL to Nebraska City ARC, PO Box 278, Nebraska City NE 68410.

DAYTON OH
APR 24–26

The Dayton ARA will sponsor the Dayton Hamvention on April 24–26. Tickets for all three days will be sold in advance only; no spaces sold at the gate. For further information, contact DARA, Box 44, Dayton OH 45401; call (513)-433-7720 for general information, (513)-223-0923 for flea market information, and (513)-223-2612 for lodging information (no reservations by phone). See display ad on page 11 for further details.

FITCHBURG MA
APR 25

The Montachusset ARA will hold a flea market at the Knights of Columbus Hall on Electric Avenue in Fitchburg, Massachusetts, on April 25 from 9:30 a.m. to 3 p.m. Admission is $1, tables are $8. Talk-in on 144.85/145.45 and .52. For reservations, send check payable to MARA, c/o James Beauregard, 7 Mountain Avenue, Fitchburg MA 01420.

HAMSATS

Andy MacAllister WA5ZIB
2310 Romayor Court
Pearland TX 77581

STATUS REPORTS

Another exciting month of excellent satellite activity has passed, and our "repeaters in the sky" are constantly changing due to eclipsing and other factors. This month, I will begin with complete status reports on all of the hamsats, and then I'll round things out with some hints on antennas for successful OSCAR operation.

I will not get into product reviews on the various antennas, but will describe their characteristics briefly. I will bypass many of the equations and physics involved and will simply look at systems that get results. For those of you who are just now joining this on-going hamsat conversation, beg, borrow, or steal the last three issues of *73* and get caught up!

Radio Satellites

The Soviet Radio satellites, RS5 and RS7, have once again entered eclipse season. This is when portions of certain orbits pass through the shadow of the Earth, meaning drastically reduced operating time for us. RS5, whose batteries are virtually gone, will yield almost zero activity. Although sources in Europe have reported that both satellites will be off till mid-March (about the time you read this), I have found RS7 to be active for at least half the passes I have monitored.

RS5 will not be heard very often, if at all, while in eclipse. Due to the battery problems, solar power is its only source of energy. When the satellite is overloaded with too many high-powered uplink signals, it will turn off. A command station must send the coded signals up to the satellite to turn it back on again. This doesn't happen over the western hemisphere. All I can suggest is that you monitor the CW beacon on 29.451 MHz when RS5 is expected and use QRP—less than 100 Watts effective radiated power (erp)—when attempting to access the transponder.

The same power rules apply to the two-meter uplink of RS7. Although its batteries are in somewhat better condition, heavy overload has occasionally turned off this satellite. The downlink signals from RS7 have not been very strong lately, but the DX has been available to those stations with the better antennas for the ten-meter downlink signals. Watch for the beacon on 29.501 MHz.

As of this writing, RS9 and RS10 are still earthbound. The extreme cold in the Soviet Union at the Plesetsk launch site has delayed activities there. I hope to be reporting on new hamsats in orbit next month.

In the meantime, I have included a frequency-planning chart for the new RS birds by WA5RON (see Fig. 1). Note that the RS10 ROBOT uplink frequency is in the 15-meter Novice band. This certainly has possibilities. Refer to last month's column for more details on RS9 and RS10.

UoSATs

The UoSAT series of scientific hamsats continues in good health. Several of you have reported success hearing the two-meter beacon signals on 145.825 MHz with HTs and simple rubber-ducky antennas. Several attitude changes have been under way on UoSAT-OSCAR 11 to invert the spacecraft. Typically, UO-11 is oriented in a stable gravity-gradient-locked position with the camera end always facing the Earth. If you cannot find the satellite's beacon on, it is due to the many experiments that the folks at the University of Surrey implement from time to time.

AMSAT-OSCAR 10

AMSAT-OSCAR 10 has provided some surprisingly good activity lately. Stations from Kuwait to Borneo have been heard and worked by stateside hams. Unfortunately, we will have little or no use of the satellite until May. Since the ground control stations cannot change the satellite's orientation in space, its behavior due to things like precession and nodal regression can be predicted as is shown in Table 1.

These calculations were provided by Ross WB6GFJ, using a computer program developed by Jim G3RUH. The most important items in this chart are sun angle and percent illumination. Sun angle refers to the orientation of the satellite with respect to the sun's radiation. Zero sun angle occurs when the sun's rays are perpendicular to the plane of the solar arrays on the spacecraft, giving 100 percent illumination. When the angle hits 90 degrees, we have virtually no illumination of the solar cells.

The other numbers on the chart, the Bahn coordinates, tell us when the satellite's antennas are pointed at the Earth. When the longitude is 180 degrees and the latitude is zero, AO-10 is aimed at the middle of the Earth when at its highest point or apogee. During the year, the latitude will move only slightly, but the longitude shows a continuous trend to smaller values. For us, this means that signals will be best early in each orbit. Later in each pass, the antennas will be aimed away from the Earth and communications will be very difficult or impossible.

I am assuming that the satellite will survive the period in late March and early April when the sun angle will be so bad that all active systems on the satellite most likely will power down and the batteries will be discharged. AO-10 has done well in this type of situation before, but there are no guarantees that things will be easy again. If you find the satellite active, keep your erp down to 100 Watts or less on the 70-cm uplink, avoid operation around perigee (possible eclipse peri-

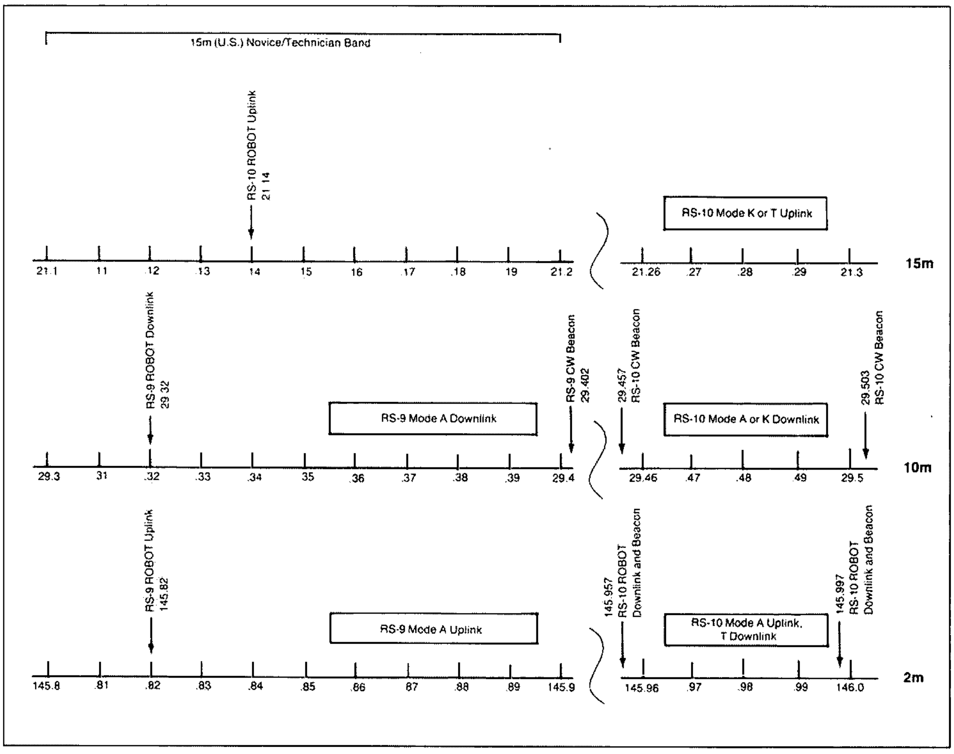

Fig. 1. Frequency-planning chart for the new RS birds.

ods), and listen to the AMSAT nets for the latest news on operating conditions.

Fuji-OSCAR 12

Fuji-OSCAR 12 continues to provide us with excellent SSB and CW QSOs. The satellite does not have enough power available for continuous mode JD operation, but we are hoping that some digital operation can be scheduled on a regular basis soon.

In the meantime, we have had five days of mode JA with two days of recharge (no operation) per week. It is not easy to adjust rotators every two minutes and keep up with the rapidly changing frequencies due to Doppler shift, so many of those now on FO-12 have added or are thinking about adding some sort of computer interface to their rotor systems. Accessories like this are helpful, but are not necessary for enjoyable FO-12 contacts. Address your basic system needs first before worrying about the bells and whistles.

ANTENNAS

To build or to buy—the choice is yours. Today, we have several manufacturers involved in satellite antenna design and production. Dishes are not common for amateur-radio satellite operation, but if someone offers you a forty footer with free installation, let me know if you don't want it! The most common antenna system for the serious satellite chaser includes a pair of crossed yagis, one for two meters and another for 70 centimeters. A ten-meter dipole, vertical, or three-element yagi will provide mode A downlink capability.

Some manufacturers and distributors include KLM, Cushcraft, Telex/Hy-Gain, and Spectrum International. Of their antennas, the most common ones heard on the air are from KLM and Cushcraft. This is likely due to their established positions as makers of a large variety of antennas, including those for OSCAR use. The Telex/Hy-Gain satellite antennas are relatively new. A review can be found in the February, 1987, issue of *73*.

Since most amateur satellites are configured for circular polarization, so too are most of the antennas manufactured for the earth station. The "sense" of circular polarization is right- or left-handed. This circular polarization can be created using the crossed-yagi design by feeding one of the yagis

DATE	SUN ANGLE	PERCENT ILLUMINATION	BAHN COORDINATES LONGITUDE	LATITUDE
Mar 5	65.1	42.1	148.4	11.5
Mar 12	72.0	30.9	147.5	11.1
Mar 19	78.8	19.4	146.7	10.6
Mar 26	85.1	8.5	145.8	10.1
Apr 2	85.6	7.7	145.0	9.7
Apr 9	79.5	18.2	144.1	9.2
Apr 16	72.8	29.6	143.3	8.7
Apr 23	66.1	40.5	142.4	8.3
Apr 30	59.3	51.0	141.5	7.8
May 7	52.6	60.7	140.7	7.3
May 14	45.8	69.7	139.8	6.8
May 21	39.1	77.6	138.9	6.4
May 28	32.4	84.4	138.1	5.9
Jun 4	25.7	90.1	137.2	5.4
Jun 11	19.0	94.6	136.3	4.9
Jun 18	12.3	97.7	135.4	4.4
Jun 25	5.7	99.9	134.6	3.9
Jul 2	-1.0	100.0	133.7	3.5
Jul 9	-7.7	99.1	132.8	3.0
Jul 16	-14.3	96.9	131.9	2.5
Jul 23	-21.0	93.4	131.0	2.0
Jul 30	-27.7	88.5	130.2	1.5
Aug 6	-34.4	82.5	129.3	1.0
Aug 13	-41.1	75.4	128.4	0.5
Aug 20	-47.8	67.2	127.5	0
Aug 27	-54.5	58.1	126.6	-0.5
Sep 3	-61.2	48.2	125.7	-1.0
Sep 10	-68.0	37.5	124.9	-1.4
Sep 17	-74.7	26.4	124.0	-1.9
Sep 24	-81.3	15.1	123.1	-2.4
Oct 1	-86.6	5.9	122.2	-2.9
Oct 8	-83.6	11.1	121.3	-3.4
Oct 15	-77.1	22.3	120.5	-3.9
Oct 22	-70.3	33.7	119.6	-4.4
Oct 29	-63.4	44.8	118.7	-4.8
Nov 5	-56.4	55.3	117.8	-5.3
Nov 12	-49.4	65.1	117.0	-5.8
Nov 19	-42.4	73.8	116.1	-6.3
Nov 26	-35.4	81.5	115.2	-6.8
Dec 3	-28.3	88.0	114.4	-7.2
Dec 10	-21.2	93.2	113.5	-7.7

Table 1. 1987 AMSAT-OSCAR 10 attitude predictions.

90 degrees out of phase with the other. The sense is selected by switching a delay line from one antenna to the other. Some of these antennas also use element staggering to achieve the circular pattern.

When purchasing a satellite antenna, you must consider several things. These include performance, price, and reliability. In most circumstances, you would consider more gain to be a deciding factor, but for satellite chasing, more is not always better. A forty-foot dish has a lot of gain at 70 centimeters, but it would be quite a chore to keep up with a low-orbit satellite like Fuji-OSCAR 12 as it goes from horizon to horizon during a 20-minute pass.

This also holds true for large yagi arrays. They might be good for moonbounce, but they are very difficult to steer accurately and quickly for most satellite work. Although the inclusion of stainless-steel hardware increases the price, it does improve reliability.

Polarization-switching relays also add to the antenna cost, but provide more versatility for operation through satellites with different circular sense. I would suggest a two-meter crossed yagi with 14 to 22 elements and a 70-cm crossed yagi with 16 to 30 elements. Larger arrays with stacked antennas may be appropriate after you gain some experience.

For the antenna builder, there are many antenna types from which to choose. Several cross-yagi designs have been described in publications like the ARRL *Handbook* and the *VHF-UHF Manual* from the Radio Society of Great Britain.

A favorite home-brew antenna is the helix. It looks like a corkscrew with a reflector plate in the back. Building one for two meters is quite a chore, but for 70 cm it is a fine performer and not unwieldy. Due to excellent broadband characteristics, its dimensions do not require the same precision during construction as a yagi. Its only shortcoming is that it cannot be switched from one sense to the other. It is either wound for right- or left-hand polarization.

Other useful satellite antennas not typically found in catalogs include VHF and UHF quads and turnstiles. For two meters, the quad is not large and won't exhibit quite the signal-fading symptoms experienced by linear yagis pressed into satellite service. The turnstile is simply a crossed dipole suspended above a reflector to give a nearly omnidirectional horizontal pattern. More detailed information on home-project satellite antennas can be found in Martin Davidoff's *The Satellite Experimenter's Handbook*.

Some Satellite-Station Setups

From the sound of it, amateur satellite chasing requires significant antenna arrays. Fortunately, this is not always the case. Although the newcomer to space communications may find minimal systems unsatisfying, the activities of some stations are very thought-provoking. Doug WB5IRI has been monitoring FO-12 using a whip antenna in the garage with a Hamtronics preamp and downconverter to a Kenwood TS-120S. Jody N5HQM has made several FO-12 QSOs using a Diamond XL-200 dual-band base-station antenna, a single run of 9913 coax, a Yaesu AD-2 duplexer, and a Yaesu FT-726R transceiver with a two-meter power amplifier.

Scott WA5LHM has been able to monitor AO-10 using a two-meter mobile antenna in the shack with a Kenwood TS-711A. Courtney N5BF has monitored his own signals through FO-12 using a quarter-wave "mag-mount" antenna in the attic for transmit on two meters and a rubber ducky on 70 cm for receive. The rigs were ICOM with a duck-mounted preamp.

Perhaps the most intriguing activities are those of Chris N5JHM, who has made mobile-in-motion QSOs via AO-10 from his pickup truck using a Kenwood TR-751A with 5/8-wave whip for receive and an ICOM IC-471H with whip antenna for transmit. These contacts were possible due to the antenna orientation of AO-10 in recent weeks.

The challenge of satellite operation with simple setups can provide a very enjoyable pursuit similar to long-haul DX on the shortwave bands using milliwatt transmitters. Come on up and join the fun!

A FINAL NOTE

The Tuesday-night, 75-meter AMSAT nets have moved from 3.855 MHz to 3.840 MHz, plus or minus 10 kHz. This was due to the crowded conditions in the General-class portion of the band. Nets start at 9 p.m. local time.■

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

APRIL

I want you to check around this issue carefully. After all, any magazine that prints a "contract" at the end of the Postal Statement (February, "What kind of dummy wastes time reading the fine print of the postal statement?. . .What further proof is needed that hams are crazy? Case closed."), or has me as a columnist, for that matter, has got to be suspect of publishing an "April Fool" article. So, those of you, and from your letters there are a lot of you, who turn right to this column first thing are excused for a bit to go looking. You won't find it here. Don't worry, I'll wait right here for you.

C-64 RFI

Back so soon? Hmmm, can't wait to take a look myself! Anyway, let's start out with a quick question posed by Bill Fletcher AF9B of Madison, Wisconsin. Bill writes, "How does one get rid of the awful rf from a C-64 when attempting to use it with a Kenwood TS-520S? The noise just plain wipes out most reception on the 520S."

One of the most common sources of RFI to the C-64 computer that I have heard about has been the type of interface, or demodulator, used. Several of them have been named as rather potent RFI sources. You might see old columns for details on this one. Lacking that source, you come down to the computer itself and the interconnecting cables. Of course, anything that should or could be grounded should be, and any extra shielding you can put between interferers and interferees (another point for the neologists among you) may be significant. Let me know your results. I am sure there are others in the same situation that may well benefit.

Amiga RTTY, Anyone?

George B. Miler, currently a computer science major at North Carolina State University, Raleigh, North Carolina, was attracted to *73* because of the RTTY coverage here, as he is interested in using an Amiga computer on RTTY. Well, George, I have zipparino in the way of information on the Amiga. Either no one out there is using one on RTTY (highly improbable) or no one has let me know what they *are* doing (on the nose!). Wish I could help you, but it will have to wait until more information is available at this end. In the meantime, if you have any success in your efforts, please pass it along so that others may benefit.

Talking RTTY Remembered

Wonder how many of you noticed the article in *73* two months ago, the RTTY issue, on "The Talking Teletype." I don't want to toot my own horn, but if I don't who will? Such a concept was presented here in RTTY Loop several years ago, using a 6800 microcomputer to receive the RTTY and channel it to a Votrax Type 'N' Talk speech synthesizer. The effect was remarkable and a blind ham I knew was suitably impressed. No doubt that some of the newer systems could do far more with less work. It does show how far we have come.

CoCo RTTY Questions

That inevitable march of progress has hit one of our gang, John R. Cooley KD9YK of Morrison, Illinois. John writes that he is an old-timer who is getting back into ham radio. He jumped from no ticket to N9FVK to KD9YK in six-week steps!

> **"Buy the computer you like, then the programming."**

John has "leanings" toward the CoCo (Tandy Color Computer) as the machine to get for RTTY, especially with the observation that the CoCo 2 can be had for less than $100 and the CoCo 3 for $220. (I have seen the CoCo 2 for less than $70 and the CoCo 3 for less than $200 in local sales—and less than that by mail order. . . mil.) Given that he wants to operate several modes, including Murray RTTY, ASCII, AMTOR, and CW, he poses several questions. I shall cover them as he asked them.

His first question wonders as to the state-of-the-art software available for the CoCo, be it the Crowston/Grosvenor described here a few months back or other. Well, the Grosvenor software does appear to be the latest for the CoCo. I don't know what else may be in someone's beta test ready to be released, but the above-cited software is very good. I will be publishing a simple machine-language/Basic loader CoCo RTTY program as soon as I receive an update from the author, hopefully within the next two months. This will not be a fully stacked bells-and-whistles program. but the price will be right.

Question two is a simple one, whether or not the commercial software will be compatible with the CoCo 3. I don't know. Most of the CoCo 1/2 programs are compatible with the newer CoCo 3, unless they use a certain area at the high end of the first 64K, which Tandy "reserved" for future use. I just don't know whether or not these programs will run and I won't until I get a CoCo 3 or someone tells me about it. Given the newness of the CoCo 3, I'm not even sure that the manufacturer will know the answer yet.

The third question is one I shudder at, and am forced to break up into three parts. First off, "Is the Pakratt, Heath, or Kantronics the preferred unit?" Come on! They are all clearly fine units, and which one you buy may well determine which one you like best, or vice versa. After all, Chrysler, GM, and Ford each have large numbers of folks who swear by, and at, each of them. But when push comes to shove, they really are all fine cars, right folks? So, ask around, see if you can play with one or all of them, compare features and what you need, and make an informed decision.

Part two of this compound question is that John is interested in the RS-232 port of the CoCo 3. Well, so am I. The serial port of the CoCo 2 was driven by a software UART in what is commonly called a "bit-banger" technique. This has the disadvantage of tying up the CPU for rather large chunks of time, and severely limits the ability of the program to do anything else. By contrast, the new CoCo 3 still uses one bit of a PIA driven by a "bit banger," but somehow allows it to be interrupt-driven, so that the CPU is not, itself, always tied up. Should be a bit more useful. Unfortunately, the solution that Tandy might have considered, that many of us have done, was to use a true serial port, an ACIA chip, for RS-232 interfacing. This option will still be available for the CoCo 3 with an outboard board, just as with previous incarnations.

And the third part, now you see why I broke this one up, is the question of IBM compatibility for the CoCo 3. It's not.

Question four is not exactly RTTY, but it is cogent. John wonders about the CoCo 3 as a video generator for ATV. Don't see why not, John, and the graphics available, up to 640 by 192, for the cost can't be beat. In fact, a little later in this column I will tell you about one way to use those graphics.

The fifth question is not about the CoCo at all, but another computer. John poses the classic question, and I paraphrase: What good is the thus-and-such program if I don't have a whoosie-bob computer? I have said before, and I will say again, buy the computer you like, then the programming. My own preferences do tend towards economy in computers, though.

John poses a lot of good questions, questions that I am sure have occurred to all of us at one time or another. I, for one, thank him for his interest, and look forward to hearing of his progress.

A New RTTYer

Another beginner in our midst is located right here in Baltimore! Craig Renier KB3KK is interested in RTTY but does not know if he has the right equipment. He says that he has a Heath HW-101 transceiver and a C-64 computer. Well, Craig, you have an excellent start. About all you need is a program and interface, both of which have been covered well here in the pages of *73*, and you should be on. Good luck, and keep us posted, too.

CoCo 3 Graphics and Other Goodies

Now, what was that I said about graphics for the CoCo 3? Our good friend Bob Rosen of Spectrum Projects, Inc., has come out with the first graphics program designed for the CoCo 3, C III Graphics. Requiring a CoCo 3 with 128K

of RAM and a disk drive, this is a 320 by 192, 16-color graphics program. With ten sets of palettes, each with 16 colors, box, circle, cut-and-paste, paint, and all kinds of other nifty features, including loading and saving a high-resolution screen to disk. Written in Basic, thus able to be modified by the user a tad, this program represents an excellent entry-level graphics program for what is sure to become a popular graphics machine. And at $19.95, it's quite a bargain to boot.

Bob has quite a few other goodies for the CoCo 3. A memory upgrade to the full 512K can be had for $139.95—I know folks who paid more for their 4K computers than that. And a book, *CoCo III Secrets Revealed*, exposes the inner mysteries of this new powerful machine for the hacker in all of us.

Need I go on? Bob has all the bases covered, it seems, for those of us who are "into" Tandy CoCos. Drop Bob a line at PO Box 264, Howard Beach NY 11414, for a full rundown on CoCo products. Don't forget to mention *73*'s RTTY Loop as where you read it.

To Come

In the coming months, stay tuned for the above-mentioned program for the CoCo, as well as a look at some other innovations in RTTY that have, shall we say, changed our hobby significantly. As always, the fabled reprint list remains available for a little old self-addressed, stamped envelope. I fancy a change in the list within the next month or so, so those of you who have requested one before might drop me another SASE, and be sure to note your request for the "new" list. That way, I will hold the envelope a bit if the new list is not yet ready.

Your questions continue to be appreciated, of course. As you can tell from this month's column, they help provide a feel for what is going on in *your* minds. Send them to me at the above address, enclosing an SASE if you desire a personal reply, or via CompuServe (ppn 75036,2501) or Delphi (username MARCWA3AJR).

As a parting note, do your duty and fill in that Feedback Bingo card somewhere near here. You'll help the staff of *73* tell what you're reading, and stand to win a year's extension to your *73* subscription! Notice I said "extension." You do already subscribe, don't you? YOU DON'T? (Not you. . . I was talking to the guy next to you.) Then use the card above the Feedback card to subscribe. That way, you will be sure to see what's new in RTTY Loop. ■

FUN!

John Edwards KI2U
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Middle Village NY 11379

MICROPHONES

Hello, hello. Test one, two.

Oh, hello there. Just testing my microphone. Wheeeee. Whoooo. Boy, this thing looks terrible. It's amazing the amount of effluvia (for want of a better word) a mike can pick up. Wow! Ever notice how a heavily used mike looks worse than the handset in the average public telephone booth—all that brown crud and stuff and everything. Yucch! Get out the Janitor in the Drum, right?

Anyway, where was I? Oh yes, microphones. Over the years I've been strangely attracted toward microphones. I don't think I'm suffering from a fetish, but I don't believe it's a natural attraction, either. Perhaps it's caused by an unhealthy fear of Morse-code tests or something.

Over the years, I guess I've owned something like three or four dozen mikes. Most of them have been absolute junk. You know, little 99-cent button jobs from Radio Shack that make you sound like you're transmitting from a Roman bath, or CB-type mikes with preamplifiers that drive your rig to something like two zillion percent modulation. They should give 'em away in Cracker Jack boxes.

The best-looking mike I ever owned was this big chrome-plated lollipop job that made me feel like H. V. Kaltenborn. Back when I was about 14 or 15, a childhood chum sold it to me for five dollars. I thought I had cut a real shrewd deal until WB2ZFF told me that I sounded as if I were transmitting from a Roman bath. When I unscrewed the top of the mike, it turned out that my buddy had swapped the original element for a 99-cent Radio Shack button job. Caveat emptor, right?

Shortly thereafter, I journeyed into Manhattan (or "The City," in the vernacular of Queens residents) to visit the Lafayette store on Union Square. At that time, around 1969, Lafayette was selling a sharp-looking crystal mike for $2.99. This bullet-shaped beauty looked like something out of a World War II spy movie. Like the 99-cent Radio Shack product, it only contained a cheap crystal element. But, damn, it looked good, with a sleek Art Deco-type styling and a business-like olive enamel paint job.

My plan was to spend the $2.99 for that mike, and then blow another $19.95 for a mike stand and boom attachment. That way, my shack was going to look like one of those super-duper operating positions they were always showing in *QST*.

So I headed for the subway with my pal Jon WA2MJK. I get to the store, go inside, point to the catalog, and tell the clerk what I want. About five minutes later the guy comes back, puts the mike on the counter and says, "Yer in luck. It was the last one left." I paid for the mike and the rest of the equipment, and with Jon in tow rushed back to the subway.

God, that stand and boom kit was heavy. The thing used a 10-pound counterweight and had a 20-pound base. Jon, seeing me struggling, offered to help me with the load. He took the quarter-pound mike out of my arms and asked, "Is that better?" I was too winded to reply.

Finally, we arrived at the subway. We paid our fares and headed downstairs. After about a five-minute wait, Jon says, "Let me see if the train is coming." So he leans out over the edge of the platform, yells, "I see two lights," and promptly drops my Art Deco beauty onto the tracks. In a flash, the Broadway local turns that microphone, the microphone of my dreams, into microphone scrap.

> ***"In a flash, the Broadway local turns the microphone of my dreams into microphone scrap."***

I spent most of the next two weeks calling Lafayette stores for a replacement. As it turned out, the Japanese company that made the mike was no longer in business, and you can guess the rest. Sigh.

Currently, I'm using a Kenwood MC-50. It's a nice mike, but it's been through the wars. During the past 10 years, I've used it to work all states, about 105 countries, and endless rag-chews on 15 meters. Friends tell me it still sounds good, but it sure ain't much to look at.

So I'm now looking for another mike to grace my shack. One of the old RCA jobs would be nice. You know the type I'm talking about. It's the one that David Letterman has on his desk. It looks sort of like an overgrown aspirin capsule, with a wire mesh on top, an RCA logo near the middle, and some solid metal trim on the bottom. I'm sure this mike has an official name, and I know all of you mike experts out there know it. But I don't, and I don't really care if you do. So don't bother writing to tell me.

Anyway, I want to put this mike in my shack for display purposes. You know, something to show company when I take them on the KI2U grand tour. Somehow, it doesn't quite befit Mr. Fun! to have a junky, disgusting, spit-riddled relic exhibited at his operating position. I want that beautiful RCA mike sitting there. As my brother recently said, "It'll be for showin', not for blowin'."

If someone out there in my radio family has one of these mikes and wouldn't mind parting with it for a fair price, I'd sure like to hear about it. But, please, don't send me one with a 99-cent Radio Shack button element installed. I'm wise to that trick. ■

NK6K > PACKET

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Q & A

This month, I'll answer some questions from readers. That's my way of saying I've really been stacked up with work this month and haven't had time to prepare a lengthy dissertation on any one subject. I'll be going to the Tucson Amateur Packet Radio meeting in a few days, where I expect to hear all about several new networking projects, and that will probably be the topic of next month's column. I'll touch on that a bit in this column, too.

Comments on the Packet Survey

I received several comments on the type of questions that were included in the Packet Poll. Gregory Lefebvre K5LTW wrote:

"I have a few complaints about the quality of the survey. It seems that the questions greatly favor positive responses to the acceptance of packet radio. I know that there are questions allowing for negative answers, but certainly not in comparison with the positive questions. Also there appears to be an exclusion of other modes, or at least treating the other modes in the past tense.

"I would be interested to see if someone in the polling business might respond with some ideas for a future survey that might be somewhat better written to allow a more accurate description of opinions, whether they are positive or negative. I certainly felt that the questions did not allow me to express my feelings about packet or how packet fits into my operating time."

I'd be happy to get suggestions for questions for the next packet poll. Notice I didn't say "next year's" packet poll; one was more work than I thought it would be.

On the subject of beacons, Jay Underdown W0OGS writes:

"I have been hearing and seeing in the print what appears to be a diatribe against packet beacons. I agree for the most part, but beacons do still have a place in packet activity and supply useful information. In my opinion, the time and space spent condemning beacons could be better used to educate new and existing packet radio users on proper beacon use and on methods of improving the network by such items as better external modems, GaAsFET preamps on receivers, etc."

Jay makes a point in his letter that while beacons are usually bad in urban areas, they have their uses in less densely populated areas. I agree that sometimes the beacon bashing gets out of hand, but that's largely a regional slant.

Watchdog Timers

I was sent a copy of a letter to the editor of the *Chatter Bug*, the newsletter of the Triple A Amateur Radio Association in Beaver County, Pennsylvania. KB3L wrote about a bad experience he had with his TNC "locking up."

"Yes, Virginia, there will be packet forums at the Dayton Hamvention this year. They'll be on Friday, so get there early."

TNCs sometimes stop running correctly. This is referred to technically as being "wedged," or OTL (out to lunch). Sometimes nothing bad happens, but sometimes the TNC will turn on the PTT line to your transmitter in its death throes.

KB3L points out that not all TNCs have a watchdog timer. This is a device that watches the PTT line and cuts it off if it is asserted for too long. Some TNCs have a built-in watchdog and some don't. If you leave your TNC on when you aren't around, do yourself a favor and check to see if your unit has one. For those that don't have one, the manufacturer will usually have a recommended design for one you can add on. Give them a call and see. I'll try to get KB3L's design for a future column.

Morality Through Software

I got a letter from one ham which said, "Can you suggest any way I can selectively prevent other stations from digipeating through my packet station? I would like to prevent beacons and connections to a BBS from running though my station."

Way back in 1983, when a second-generation command set for TNCs was being discussed, the concept of lockout came up. At that time, we thought that this option would cause more trouble than it would solve. Since there aren't any bits in the protocol that gets set for packets that originate at a BBS, and since beacons don't necessarily have the text "BEACON" in them, you are limited to locking out packets based on the origination station call or the destination station call.

Our feelings on the matter were that if other users were not willing to voluntarily avoid using your digipeater in ways you disagree with, locking them out personally by call would just propagate hard feelings. Going with "out of sight, out of mind," the BUDLIST/LCALLS were originally oriented toward keeping the "bad guys" off of your screen by locking them out of your local monitor mode. They would still be repeated.

Attempts to mandate morality through software are seldom successful at reasonable cost. My suggestion to this reader is to take some deep breaths or get a dog (it's been proven pets lower your blood pressure). Alternatively, some new software may have this feature; check around. A hardware box to monitor the incoming bit stream is doable, but it wouldn't be much less complex than the TNC itself.

Auto-forwarding

John Skubick K8JS wrote to remind me that many readers are running low-end computers with their packet equipment, and that many authors are writing columns for the high-end machines. The Packet Poll certainly shows that there are a large number of low-end users out there, and I'll keep that in mind.

John also asked for a short lesson on sending mail to distant stations using the auto-forwarding system. Many BBSs can forward mail. To find out if your local system can, ask the local sysop. Of the systems that can forward mail, most do so with the following command: S call @ bbs (for example, S WA2KDL @ NK6K).

The spaces are important. The command shown will send a message to WA2KDL at the NK6K BBS. You'll have to make sure that your local BBS knows how to get to the BBS call you placed after the @. Again, ask your sysop to make sure.

New Hams

Christian V. Moreau N3FDP writes: "I not only worked to get my license as a result of packet radio, it is the only mode that I have ever used." He goes on to say that he doesn't expect that this will always be true. He wants to try ATV and the microwave bands.

That's what I'd like to see more of, packet getting a different segment of the population "hooked" on amateur radio. Once they're here, who knows what else they'll find that they'll like. It's sure that we need to keep new blood coming in.

As I write this, an FCC notice of proposed rule-making has come in which proposes to take away part of 220. I haven't seen the text and won't comment further this month, but the comment period will close before I get to speak again. The procedure for commenting to the FCC has been discussed in a previous column. *(Also see the QRX story on this subject.—Eds.)* This is particularly disturbing since Skip WB6YMH has just gotten 9600-baud packet activity stirred up on 220.95 here in the Los Angeles area.

How Soon We Forget

Remember back in the dim distant past when the new packet mode had to fight for space in the crowded two-meter band? Back when you had to petition the local frequency coordinating councils, go to meetings, write papers, or just squat on the channel and make nasty "braap, braap" noises to build a home for packet?

In the still fast-growing mode of digital radio, a new type of packet is starting to be heard, and some of the old-timers are starting to kick up a fuss about getting that new stuff on the traditional "packet" channels. The funny thing is, of course, that a packet "old-timer" is anyone who's been on for a year, and the really ancient

patriarchs are those who have been around for two years. The ink on the band plan defining the "traditional" packet channels is barely dry.

The new kid on the block is actually any of several new systems based on higher-layer protocols. Back in the analog vs. digital turf wars, the complaint was nasty noises in the ears. In new-digital vs. old-digital fracas, the complaint is nasty characters on the screen.

Most of the new protocols (like those discussed in KA9Q's networking article in the August, 1986, packet issue of *73*) use the data portion of an AX.25 frame to carry the information from their higher-level packet. Some of that data is control information and some is clear text. Depending on what kind of computer or terminal you have, this control information will print as Greek, lines and arrows, smiley faces, or if you have an old OSI computer, even pieces of the *USS Enterprise.*

The control information is an integral part of the new protocols, just as is the control information in the part of the AX.25 packet that isn't usually displayed in monitored frames. As development on these new systems continues, more and more of the packets you see on the air will contain "garbage." These systems have names like Gator, TexNet, TCP/IP, and NetRom.

Building the amateur packet radio network is like building a highrise. We started to build the first floor, and while building the second floor, because it was cold and rainy outside, we all moved into the first floor. Because it was a lot more fun furnishing the first floor than it was standing in the cold building the second, most of the time has been spent in (or magazine articles written about) that first floor. But now there are a bunch of nuts walking on the temporary roof, pounding away at all hours, and walking though the first floor carrying bricks and leaving a trail of mud.

What am I saying here? The packet network is still under construction. You'll be seeing some funny characters in monitored packets, especially this summer. Once that second story is built, there will be new software, new terminal programs, and new options to avoid seeing garbage on the screen.

Until then, explore the ways that the current TNCs offer to avoid seeing trash. Most TNCs have a way to restrict monitored packets to a list of stations you want to see, or a list of stations you don't want to see. Many can filter out particularly annoying characters such as the bell and clear-screen characters.

On the other hand, we must keep in mind the basic requirement of "monitorability." The third-party traffic rules as amended by the FCC to allow unattended packet operation are based on the following thought: While the traffic may not be easily monitored while in transit between network relay points, it IS monitorable at the entry point to the network.

Another point made by the amateur community during the 85-105 rule-making proceeding is that there are a large number of folks "reading the mail" and carrying on the tradition of self-policing the ham bands. We've got to make sure that this continues to be true, even at the expense of a few extra bits.

Dayton

Yes, Virginia, there will be packet forums at the Dayton Hamvention this year. They will be on Friday, so get there early. The current schedule, subject to change, includes Bob Neben K9BL, Dave Pederson N7BNC, and the infamous Dr. Dave Toth VE3GYQ for the Fundamentals and Tutorial session from 1300–1445. The 1500–1700 session includes Lyle Johnson WA7GXD and me on packet technical developments.

I'll also be wandering the displays at Dayton, but you probably won't see much of me at the *73* booth; there is usually a sign posted prohibiting verbal dart throwing. Speaking of which, a friend of mine called the *73* subscription number to ask for a *73* subscription because of the great digital column. What he got was a year's worth of *Digital Audio*. See you next month.■

NOVICE NETWORK

Perry Donham KW1O
73 Staff

WHAT IS A NOVICE?

What can you do with an FCC Novice license? *Communicate*, that's what! You can talk with other ham operators around the world, from Australia to Zanzibar. It doesn't cost a lot of money to do (in fact, the license itself is *free*), and you don't need an engineering degree to understand the electronics required to pass the Novice test.

That's what this column is all about—how to pass that first test on the ladder of amateur radio. In the months to come, you'll learn everything that you need: FCC regulations, a little electronics, and the art of hamming. We'll be going pretty fast, since you're undoubtedly anxious to get your own callsign!

The Novice

In the early sixties, the American Radio Relay League decided that the old system of two classes of ham licenses wasn't promoting growth in the hobby. They sat down and came up with a plan called Incentive Licensing, which divided up the available spectrum into chunks. A ladder of license classes was created, and the higher you could get on the ladder the more privileges you got.

Incentive licensing has evolved into our present five-tier system: Novice, Technician, General, Advanced, and Extra. The amount of electronic theory required to upgrade to the next license increases as you move up, but the privileges increase as well. An Extra-class licensee has all amateur privileges on all bands.

As a Novice, you'll be able to use Morse code on four bands and voice on three. You can also use your computer to talk over the air. You must pass a five-word-per-minute test on the code, and a very simple exam on electronics theory and amateur practices. The rules governing Novices have just changed, and we haven't seen the full text of the regulations yet; in the future, I'll give you a full rundown on the new spectrum and modes available, as well as a summary of how the testing for Novices has changed.

The Code

Yes, you still have to learn Morse code to get a Novice ticket. Maybe next year we'll finally have a code-free license, but for now you'll just have to do it. I won't give you any song-and-dance about how wonderfully artsy code is (it isn't) or how it will "make it through" in an emergency when all other modes fail (it won't). The law says that hams must pass a Morse test, so just learn it because you have to.

Obviously, I can't teach code in a magazine. Go out and buy one of the code-teaching tapes on the market—*73* happens to sell one that's pretty good. Most of the ones you can get are pretty much equal when it comes to ease of learning, but you should look for a tape that sends characters at 13 words per minute with spacing set at five words per minute. If you learn code that sounds like "daaaaaahhhh diiiih daaaaaaaaaaahhhhh," you'll be in for some real trouble when you realize that you have to copy code that really sounds like "dah dih dah."

The other bit of advice I can give you is NOT to learn code by writing down all of the little dots and dashes and staring at the paper for hours. It won't work. You have to actually hear the stuff to learn it right. The absolute best thing that you can do is to get someone who will sit down with you and teach you code. Classes are OK, but one-on-one is the best method. I've been doing code lessons for

QUIZ

1. What are the five classes of amateur license?
2. What code speed is required for the Novice-class license?
3. What government body regulates ham radio?
4. What is the symbol for current?
5. What does the symbol E stand for?
6. What is the voltage in a circuit with 3 Amps of current and a total resistance of 500 Ohms?
7. What does Ohm's Law look like when solved for resistance?

years this way, and it seems to take about three weeks of lessons three times a week to get to five words per minute.

Theory and Regs

Apart from the code, you'll be expected to know the barest amount of information about FCC regulations and electronics theory. As I mentioned, the rules have changed to allow Novices to use voice and data communication, so there should be additional technical questions covering the new modes. I don't expect them to be too difficult, though, so not to worry.

Traditionally, FCC reg questions are best answered by relying on your common sense: Questions pop up like, "Is it legal to send unidentified transmissions?" (Hint: It isn't.) The theory section is pretty much the same. You'll need to know a few simple formulas and terms.

What I'm trying to say is that getting a Novice license is *easy*. Note: This column will *not* teach you electronics! It *will* give you the information you need to get a Novice license. You won't find many theoretical explanations here.

ANSWERS

1. Novice, Technician, General, Advanced, Extra
2. 5 wpm
3. The Federal Communications Commission (FCC)
4. I
5. voltage
6. 1,500 volts
7. R = E/I

First Lesson

OK, I've pretty much blown my space with a description of what it is you're getting into, but we'll do a quick lesson before your attention span runs out. One of the primary electronic principles is **Ohm's Law**. You'll run across it in one form or another in just about every field of the hobby. Simply stated, Ohm's Law says that the current in a circuit is equal to the voltage in that circuit divided by the total resistance: I = E/R. The symbol I is for current, measured in Amps; the E is for voltage, measured in volts; and the R is for resistance, measured in Ohms. (I always remember the formula with the phrase, "The Indian looks at the Eagle flying over the Rabbit.") Using a little algebra (did I mention that you need math, too?) you can come up with two other relationships: E = IR and R = E/I. Simple, eh?

Plug in some numbers to try the formula out: What is the current in a circuit with a total resistance of 10 Ohms and an applied voltage of 50 volts? Since I = E/R, I = 50 volts/10 Ohms; I = 5 Amps.

I won't bore you with numbers to plug in *ad nauseum*. You get the idea. Try the quiz on the preceding page and check how you did. See you next time.■

QRP

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QRP CLUBS

Well, it looks as if I'm going to have to skip a month or two before getting that Field Day column ready. I always forget about the difference between when I type in these columns and when the actual issue comes out.

After reading the past few months' worth of mail, I've concluded that everyone wants to know about the different QRP clubs. Some of the letter writers asked if there are in fact QRP clubs to join. Well, this month's column will be about these clubs.

The Michigan QRP Club

I'll start things off with the Michigan QRP Club, which is a member of the World QRP Federation. This club was organized on January 19, 1978, by a small group of ham operators in the Lansing area of central lower Michigan. When the club first started operations, most if not all the members were from the area, hence the name of the club. The Michigan QRP Club has now grown to include members in 20 or more states, several Canadian provinces, and several European countries. The club has designated QRP as 10 Watts input or 5 Watts output or less.

What surprised me the most is the club emblem. Each person receives a club patch when he sends in an application for club membership. The emblem was designed and adopted during the early months of the club's existence, when the founders were not seeing beyond Michigan's boundaries. In fact, the first version didn't even show the Upper Peninsula of Michigan. Since the emblem was made to be used as a patch for display on jackets and hats, it's very colorful.

No matter what type of club you join, that organization needs to have a purpose. The Michigan QRP Club constitution states its intentions as follows:

1) To foster and develop friendship and cooperation among amateur radio operators who have a common interest in the unique pleasure and challenge of operating amateur transmitters at power levels of 5 Watts output or less.

2) To sponsor such actions and activities as may be deemed proper and consistent with the purpose of the organization.

3) To take general interest in all matters affecting or involving amateur radio.

If you're not a real diehard QRP person, the club has no restrictions that you must run low power all the time. If it takes a kW to get the message through, so be it. The member's good judgment rules on such cases.

Any club worth its salt has some kind of award program. So, not to be left behind, the Michigan QRP Club has several to offer. The QRP WAS award and the QRP DX award are the club's two big ones. The WAS is, of course, Worked All States running low power, while the QRP DX award is given for working 25 countries while running QRP. The club also gives out a QNI award for checking into the nets a minimum of 25 times. A special award is the WMA, for working at least 10 members of the club, with endorsements for 15 and 25 members. A good place to start for the QNI and the WMA awards would be the weekly nets. The Michigan QRP Club holds a net on 3.535 MHz on Tuesdays at 9 p.m. EST.

To keep all this together, the club publishes a quarterly newsletter called *The Five Watter*. It contains accounts of club activities, technical articles, and correspondence from club members. Reports of awards, QRP contests, nets, and QRP operating are also included. Tom Root WB8UUJ does a bang-up job as the editor. Having been a member of this QRP club for a while, I can say that *T5W* is packed full of QRP goodies every quarter.

If all this sounds too good to be true, then by all means drop a letter off to the Michigan QRP Club, 5346 W. Frances Road, Clio MI 48420. If you decide to join, you become a member for life. The club dues are only $7. That includes the first year of *T5W* and covers the $2 initiation fee. After that, the yearly dues are $5. That's not bad considering the price of postage these days.

The G-QRP Club

Moving to the other side of the ocean, we have the G-QRP club. The name of the club gives us a clue as to which country I'll be talking about—England.

The G-QRP club was founded in 1975, and it now has more than 4,000 members in 54 countries. The club exists to promote interest and growth in low-power amateur radio communication (5 Watts or less). Membership is open to any licensed amateur or shortwave listener anywhere in the world who has an interest in low-power communication. The annual membership fee is $10.

The G-QRP club publishes a free quarterly journal called *SPRAT* (Small-Powered Radio Amateur Transmitters). It contains circuits, technical hints, and ideas for QRP construction projects. *SPRAT* also contains club news, contest and award information, and other items of interest to QRP operators.

Club members may also receive low-cost Morse-code training tapes. A data sheet service is provided free to club members. These sheets cover articles of QRP interest from different overseas magazines, which may be too long to be printed in *SPRAT*. This list is constantly being updated and new sheets are listed in *SPRAT*.

The G-QRP club also runs its own free QSL service through which cards can be interchanged between members (cards are mailed with *SPRAT*. To top all of this off, the club offers a wide range of awards. Weekly club activity takes place each Sunday between 1100–1230 and 1400–1500 UTC on the International QRP frequencies.

To become a member of the G-QRP club, write to: Membership Secretary, Christopher Page G4BUE, Alamosa, The Paddocks, Upper Beeding, Steyning, West Sussex, BN4 3JW England. The stateside QRP operator should either send a $10 bill or a check made out for the amount of $12. The extra $2 is to cover the conversion at the bank. Don't send IRCs. It will be the best $10 you've spent in a long time.

QRP ARCI

The final QRP club I'll talk about has been around for some 20 years. It is the QRP Amateur Radio Club International, or QRP ARCI for short. This club was founded in 1961 by K6JSS. It's a nonprofit organization dedicated to increasing the worldwide enjoyment of QRP operation and experimentation. QRP, as defined by the club, is 5 Watts output CW and 10 Watts output PEP.

With a membership of more than 6,000, the club sponsors many contests. Among them are two large CW contests, one in April and the second in October. They have proven very popular with the QRP gang. Aside from these, the club has a wide assortment of awards. One of the most treasured of these is the 1,000-mile-per-Watt award. Working 1,000 or more miles per Watt may not appear at first to be a big deal. Have you tried? Try it on 432 MHz with 5 microwatts output over a 10-mile path. It's been done, but it wasn't easy. How about working Australia with 1 Watt output for 12,000 miles per Watt? Does this peak your interest? I hope so.

Besides all the awards, the club publishes a rather slick newsletter four times a year, called the *QRP Quarterly*. Printed in January,

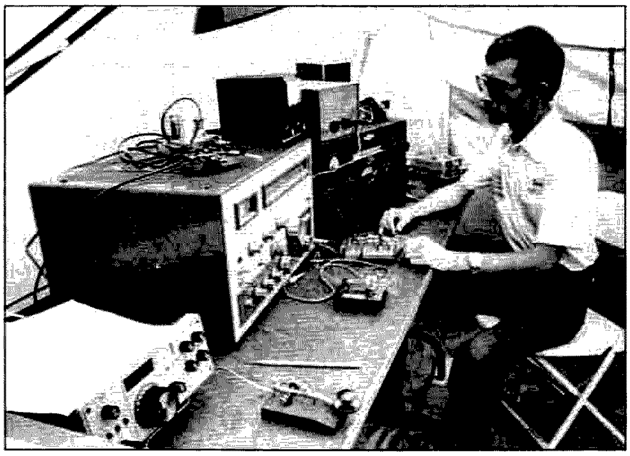

Photo A. Terry N8ATZ, vice-president of the Hate Mike Bryce Club, pounds some brass for the 1985 W8NP Field Day. Note the "hi-tech" CW radio on the same table as the Heath Apache and the Collins 75A4.

April, July, and October, it brings all the latest information to the active QRPer. Each issue is packed with some of the best construction projects for the QRPer. Antennas, tuners, and DX-chasing tips can always be found inside the *Quarterly*. There is even an article or two about solar-power QRP operation from yours truly from time to time.

The QRP ARCI also sponsors a first-Sunday informal QSO party, as well as several national QRP nets. The list of the nets was given in this column several months ago.

To become a member, send for the membership guide from the club's publicity manager, Joe Sullivan WA1WLU (267 Sutton Street, North Andover MA 01845). While I have never seen what Joe sends out, I hear it's a bundle. To keep Joe from tapping into his beer money, send along $1 to cover postage costs. Speaking of money, new memberships to the QRP ARCI are $8; renewals are $7.

Doing Your Share

That's about it for the QRP clubs. Yes, there are some smaller ones about, but I hear very little from them. So here is your chance. Write and let me know about your small QRP club.

There is one footnote that must be brought up. Almost every one of these clubs operates on volunteer time. Working to feed the kids, the wife, and the dog sometimes leaves very little for the radio clubs. Don't get mad if it takes a few weeks to get a reply to your questions and letters. Also, be a sport when writing to any of these clubs and send an SASE.

Photo B. A Novice training class at the Massillon Amateur Radio Club (W8NP). A talk about QRP and the lower cost of the gear may win over a few newcomers to ham radio. Photo by WB8OWM.

While we are on the subject of radio clubs, what have you done to spread the word of low-power operation to your local club? Most are just starving for a program at the meetings. QRP is a good start in such endeavors.

Have you been active in your club's Novice training? Your local club DOES run Novice classes doesn't it? The small size and portability of QRP gear is ideal for a hands-on demo at a Novice class.

If you think that I'm leading into something, you're right. To get new people into this hobby we call ham radio, we have to make it fun. Nothing less will do. Take a look at Photo A. This is a W8NP Field Day setup. No, the photo wasn't taken in 1957—it was in 1985. We did it as a dare and to have fun. We even made some contacts with this setup. Most of the new Novices liked the look and feel of the vintage radios. We had a ball.

Get active in the local club. While I don't quite know what came over the crew at W8NP, Steve NØCVZ and I were voted vice-president and president of the club. I sure hope they know what they did! Don't be an invisible QRPer. Get involved.

Till Later

Looks like the old computer is just about done with this month's column. Next month, by popular demand, I'll have the plans for my 6L6 QRP band-buster rig. I'm sure you'll enjoy putting one together.

As always, send your ideas, comments, and suggestions to me. I gather strength from them all. I ask only one thing, if you would like an answer or a circuit schematic, please send an SASE. In fact, I'll write the address down if you send along a stamp.

While you're at the post office, remember to send the Reader Service card back to *73*. Remember in my first column I said I needed the money. Well, I plan to purchase a new bike this summer. What's this? OHMYGOSH, you mean to tell me that the guy who writes this is a biker? A long-haired, pot-smoking, hippy freak? No, really, I'm talking about bicycles, the people-powered kind. I'm going to do a column on very small, lightweight radios for backpacking and cycling. So until next month, use intelligence instead of power. It's a lot more fun.■

LOOKING WEST

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INTERVIEW WITH A LEGEND: PART I

If I were to ask you who was the one person directly responsible for your favorite repeater, you would probably respond by giving due credit to the person whose callsign appears on the system's identifier. Or, you might name the club that supports the machine. Well, you would probably be correct on a tunnelvision-like scale, but in the overall cosmos of amateur relay communications, you would be very far from correct.

If credit is truly given where credit is due, every FMer owes gratitude to a ham most have never heard of—a now-retired Los Angeles broadcast engineer named Arthur M. Gentry W6MEP.

Art has never laid claim to having put up the world's first FM repeater. If I remember correctly, Wayne Green W2NSD says that he and a friend put up a RTTY repeater in New York City in the late 1930s. But, there is a big difference between being the first and being successful on a long-term basis. In the case of W6MEP, his repeater (which was first operated under the callsign K6MYK) went on the air in the late 1950s, and one way or another it has remained in service ever since.

Almost two years ago I visited Art. After the usual amenities, the two of us adjourned to his front yard where we sat down with my cassette recorder between us. What follows in this month's column (and is concluded in next month's column) was garnered from that interview and from updates from subsequent conversations between Art and me. I invite you to sit back and read what I can only call an interview with a man who should be considered a legend in his own time.

73: Art, when did you first put K6MYK on the air?

Gentry: In September of 1956 we started operation. We went to the Mt. Lee site in October of 1958, but there were other sites in between. The original license for K6MYK was issued in 1954 for a location in Burbank, California, but that was never used. The repeater went to remote control in June of 1957 when we finally got on a hilltop, but we were already well-known from our operations here in the San Fernando Valley. . . It's been on the air ever since. *(Note: Since the interview was taped, Art has moved his repeater to the top of Mt. Wilson at an altitude of 5,600'.)*

73: Do you know if you were the first repeater in the country?

Gentry: I can't say that we were the first repeater in the nation because at the 1954 ARRL convention in San Jose, a group of people put up a 2-meter AM repeater in the Berkeley Hills. Later that year, we went on a vacation to Colfax, a city north of Sacramento, and we worked through the repeater for a distance of 300 miles down to Lemmore. That machine was K6GWE, and it stayed on the air for a few months and then reportedly fell by the wayside. It was not what we know of today as an open machine. Rather, it was on the air spasmodically. If you were lucky enough to get in when the guys had it on, that was fine. Otherwise. . .

73: Do you know whatever happened to that repeater?

Gentry: Well, as I remember, it came back on the air several years later in the San Francisco North Bay area. Actually, the machine is probably still around. That is, you may be able to trace the lineage down to the present. It's still in the North Bay area, though I

am not sure of its present call.

73: What was your motivation to put up K6MYK?

Gentry: This was a way of extending the range of VHF. I've operated VHF mobile since 1940 when I went on 112 MHz, and I ran very high power...a 35-T modulated oscillator. Receivers were all super-regeneratives.

After World War II, when the 2-meter band was opened up... which I remember happening in January of '46, I acquired an ARC-4, which I made into a crystal-controlled, 10-Watt transmitter and a tunable receiver. Many still remember the old ARC-4 I'm sure.

That was a mobile rig, and I can remember going to Mt. Wilson one time. I came on the air and it was like a foreign country showing up. I talked my lungs out going from one station to another as fast as I could for two hours! This pointed out the advantage of a high location, and I began looking for remote-controlled transmitter articles in amateur magazines. But, in the late '40s and early '50s, all you could find was information on how to remotely control a transmitter. Nobody had ever thought in terms of a completely remote-controlled station.

73: So you built one?

Gentry: The marrying of a receiver and a transmitter took a lot of long hard work. It also meant a lot of spectrum separation along with a lot of tinkering and puttering to eliminate interference and desensitization. In fact, one of the biggest problems with early repeaters was if we had our receivers on the low end of the band—as when we were receiving on 145.08 MHz, which was a net frequency—then the transmitter had to be up near 147.70 MHz. Most of the people using the repeater had big beams and good receivers tuned to the low end. When they had to move their receivers up almost 3 MHz to hear the repeater, they got into problems because their antennas were way out of their tuning range. That was as close as we could get in frequency with that era's state of the art.

Later on, we built our own completely new receiver that permitted less separation. Remember, you couldn't buy anything. Nor could you find information on how to do this. So, we were left to use our own ingenuity. We had to find ways of getting rejection of the transmitter on the receiver to eliminate the problems. These things you could never find in print, but you were also too busy that there was not any time to write an article—mainly because so few people were interested. And besides, who would have published it?

73: When you were experimenting and building back then, did you ever think that the interest in repeaters would grow to the proportions they have today?

Gentry: I think I can say "yes" to that question. Yes...because my logic told me that this was a good way to get better communications. If you can imagine a 10-Watt AM mobile running all over the greater Los Angeles area and never being out of communications range with someone else, and you do this way back in the early '50s, then you have a pretty good idea of why I say that I had faith. There was something else. I observed the growth of commercial two-way radio at elevated sites...and I knew it would eventually happen with amateurs. I also knew that this would become a very widespread idea, and, with the adoption of FM, I knew it had to happen!

As an aside, my personal communications went to FM in the early '60s, and I started full-time FM in my automobile in 1966.

73: But, K6MYK was an AM repeater and it remained AM for quite a long time. Why?

Gentry: It remained AM because it served a great many people then using that mode. It was still "their repeater," if I may use the term. When the activity dropped to where there were no customers, then there was no sense keeping it on AM any longer.

There was also a second factor. At the time, we knew that there would be new repeater rules coming out, and concurrent with that was the channelization of all bands in Southern California. We applied to SCRA and got a repeater pair at that time, with the intention of going to FM. By the way, the repeater's control system has been FM since the beginning, and some of the original control equipment is still in operation.

73: There are now more than 300 repeaters on 2 meters in Southern California. Did you expect this?

Gentry: It's hard to say how far I expected it to go, because you can't really look ahead, but I would like to point out some history for you. I believe it was in 1967 that Howard Sheperd became the ARRL Director in this division. We tried through Howard to get the League to pick up the bit on repeaters and get some rules changed because we had essentially no repeater rules. I wrote to Jon Griggs W6KW when he became Director requesting that he get the League to do something. This was about the time of the Don Miller lawsuit, and before the board of directors was a motion to develop "Advisory Committees." The Board voted for this...and this left an opening for Jon to make a motion to create a VHF Repeater Advisory Committee. Jon then asked that I help him outline how the committee should be formed. I was also one of the first members of that committee.

73: In your opinion, why, after forming the VRAC, did it take the ARRL so many years to really get involved in VHF/UHF relay communication?

Gentry: The League has traditionally been conservative, and from the standpoint of...let us say... the best interest of the League, that is basically a good policy. We want to maintain what our League is, what it has been, what it stands for, and so on. You just cannot go out off the deep end every time something new comes along. I just don't think that back then there were enough people in the ARRL who were exposed to repeaters, who understood the concept, and who knew what to do about it. Even before the days of repeaters, League officials would come out here and could not believe the level of VHF activity. They thought it was a put-on, that everyone got on the air to make a big showing for them. They just didn't realize the use we were putting into VHF.

"The pioneer spirit that came west is still here. It's in our basic attitudes."

73: If this is all true, and the early California repeater growth was as you say, then why did it take the rest of the nation over a decade to catch on that so many of these machines existed?

Gentry: Let's put it this way. Take W6MEP...the callsign that K6MYK uses these days. It's currently located about 5,600′ above sea level. But even in the early days, there were probably 5 to 7 million people it could reach. Today, that's probably closer to 20 million. I doubt if very many other repeaters serve a larger population group than those out here in the major California cities.

Now, California has a very unusual geography. It has lots of elevated sites. The early people who got into 2-meter repeaters were, for the most part, the people in commercial radio. They got into the business because the concept interested them, not so much at first as repeaters but as remote bases. They'd be controlled over telephone lines. It took only a few sharpies to find out that they could couple a receiver to a transmitter, and this brought on tremendous area growth. Also, there were people...hams living at elevated locations and wanting out of the hassle of the lower frequencies. They found that they could ragchew for hours on 2 meters without interference.

Now, you remember that out here we have repeater sites with line-of-sight coverage for several hundred miles. You go back East...in the plains or coastal areas, and if you can get to a height of 500′, you are doing well. In New York City, they have places you can get up maybe 1,000′, but look what you have to contend with. The concrete canyons are one of the worst things in the world to try and get signals in and out of. Then, too, the West has always been known for its innovativeness. It was a big, wide open country, and people had many generations out here where it was up to the individual to get out and do something. That same spirit has shown itself in amateur radio. To be innovators. To be pioneers. The pioneer spirit that came west is still here. It's in our basic attitudes. A lot of people like you who came out here from the East have adopted this philosophy because you like that attitude and that spirit. You must remember that early television was spawned out here in parallel with the East, and it developed very rapidly once there was a chance for it to get a start.

I can remember when we used to swear at the Don Lee Broadcasting system because its third harmonic fell right in the middle of the 2-meter band. Ironically, as K6MYK and then WR6ABN, my repeater also operated from the original Don Lee broadcast site. That's also a bit of history.

And it's a bit of history that will have to wait until next month. For now, 73 from those of us who work and write the late shift from Los Angeles. ■

WEATHERSAT

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TIMEBASES

Way back in the December column, I promised to talk about timebase circuits and then proceeded to get sidetracked. This month I will get back to timebases, if only to avoid piling up too many unrealized promises!

All of the direct-broadcast weather satellites that most of us are likely to be interested in transmit video at either 240 lines per minute (lpm) or 120 lpm. The former includes the WEFAX transmissions from the U.S. GOES, European METEOSAT, and Japanese GMS geostationary satellites; single mode (either visible or IR display) from the U.S. TIROS/NOAA polar orbiters; and advanced Soviet METEOR/COSMOS transmissions. The 120-lpm rate is used for display of the "standard" Soviet METEOR imagery and simultaneous display of visible and IR data from the U.S. TIROS/NOAA spacecraft.

If you are going to display the pictures on FAX, you will probably be using a 240-rpm or 120-rpm synchronous drum or helix motor (or some other synchronous speed with suitable gearing to get the same end result). If you want to use a slow-scan-type CRT display, you will want to trigger your horizontal display at either 4 Hz (240/60) or 2 Hz (120/60).

Some approaches to scan conversion also use the equivalent of such line trigger pulses to establish timing for the loading of image lines to the computer or display memory. Other scan converter designs (such as the one in Chapter 10 of the *WSH*) use hardware clocks to pace the loading of individual pixels into memory and as the basis for line delays that are essential to the operation of almost any scan conversion software.

The point is, no matter how you plan to display pictures, it requires some pretty accurate clocks in order to keep your display in synchronization with the incoming satellite video. All the various satellite video sources have their line rates locked to crystal-controlled standards, so proper display of "live" pictures, directly from the receiver, requires similar accuracy on the part of the display timebase if you are to keep in step.

You might have a 240-rpm, 110-V, 60-Hz synchronous motor running your FAX drum for WEFAX display, for example, but it would never do to run that motor off the ac mains. Most of us are aware that the long-term accuracy of 60-Hz ac is pretty good; after all, we do run all those wall clocks from just such a source.

Unfortunately, while long-term accuracy is good, short-term accuracy may be quite variable. Any frequency excursions from *precisely* 60 Hz during the minutes of image display will cause the motor to run slightly faster or slower than the rated 240 rpm, and that will throw off image sync. Similar problems arise with any other timebase for CRT or scan-converter display.

Most operators would also like to be able to tape-record satellite images for later playback and display, but that introduces a whole range of new problems. Even the best stereo tape deck will have some short-term variability in recording and playback speeds. (You can see the magnitude of these in the wow and flutter specifications.) Speed changes during recording or playback result in changes in the rate of the video data, so while crystal-controlled frequency standards will handle "live" display, they can provide no direct help for recorded display.

You can get around this problem rather neatly by using a crystal-referenced source for display and using the same system to generate a clock signal or reference tone. The satellite signal can be recorded on one stereo channel, while the reference tone is recorded on the other. During playback, the reference tone is used in conjunction with a phase-locked loop (PLL) to lock the display timing to the recorded reference tone.

Tape speed will certainly vary during both the recording and playback process, but now the display timing will "track" such variations, giving you a solid display provided your initial reference tone was produced with sufficient accuracy! Let's look at some of the possible approaches for crystal-referenced timebases, including the needed reference tones for recorded display!

Subcarrier Lock

One of the neat aspects of U.S. weather satellites (and the more advanced Soviet METEOR/COSMOS spacecraft) is that the 2,400-Hz audio subcarrier (which is amplitude modulated to produce the video signal) is typically locked to or of comparable accuracy to the timebases used to generate the video timing. This means that the satellite subcarrier itself can be used as the master time reference for image display.

If you digitally divide the 2,400-Hz subcarrier signal by 600 (a divide-by-six stage followed by two divide-by-ten stages), you would have an accurate 4-Hz line pulse. Divide the signal by 1,200 (substitute a divide-by-12 for the divide-by-six stage in the preceding example) to get an equally accurate 2-Hz signal! Need an accurate source of 60 Hz for your drum motor? Simply divide the 2,400-Hz signal by 40 (divide by four and then divide by ten) and you are in business!

Of course, things are never *quite* that simple; you cannot simply feed the AM 2,400-Hz subcarrier into a TTL or CMOS divider chain, but it can be almost that easy with the circuit shown in Fig. 1 (a). This is a PLL tone decoder with a sample of the 2,400-Hz subcarrier applied at the input.

With the proper component values shown in Table 1, this chip will lock to the 2,400-Hz tone and the OUT signal will be a nice square-wave sample of the PLL 2,400-Hz voltage-controlled-oscillator (vco) signal. This square-wave signal can be divided to yield any of your needed display frequencies!

An advantage of this circuit over a PLL such as the 565 is that the 567 has an internal control transistor that will light the LOCK LED when the chip is properly locked to the input signal. With a 2,400-Hz subcarrier at the input, the vco pot is simply adjusted until the LOCK indicator stays on with signal modulation.

A major advantage of the subcarrier lock approach is that the satellite signal itself is your reference tone so you need only a monaural recorder or a single stereo channel for recording. Recorder speed variations will be reflected in changes in the 2,400-Hz subcarrier frequency, but these small shifts will be tracked by the PLL in the 567 and your timing will stay in step.

Subcarrier lock is extremely popular for those just getting into satellite display because it is quite simple, but it is not without its drawbacks. In order to maintain sync, the system must stay locked to the satellite subcarrier signal.

This can become impossible during a deep fade in a polar-orbit pass or during a burst of intermod or other interference, and it also becomes a problem during occasional episodes on GOES where the WEFAX modulation becomes misadjusted, causing the subcarrier to drop to 0% amplitude on black instead of 4%. The technique also doesn't work with most 120-lpm Soviet METEOR space-

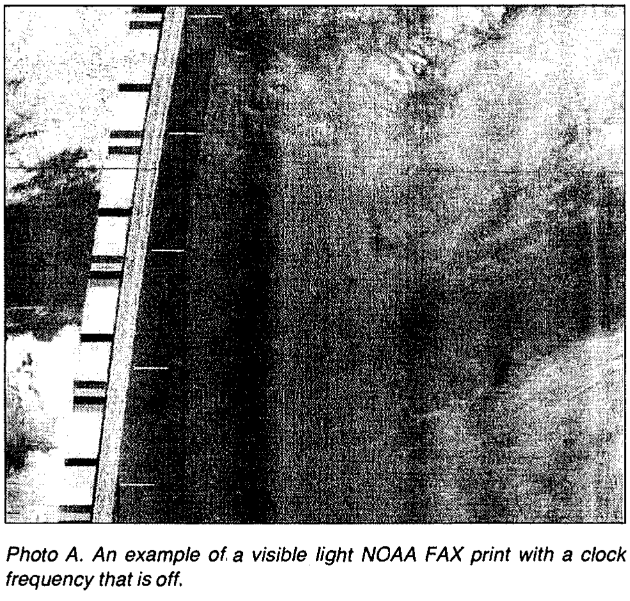

Photo A. An example of a visible light NOAA FAX print with a clock frequency that is off.

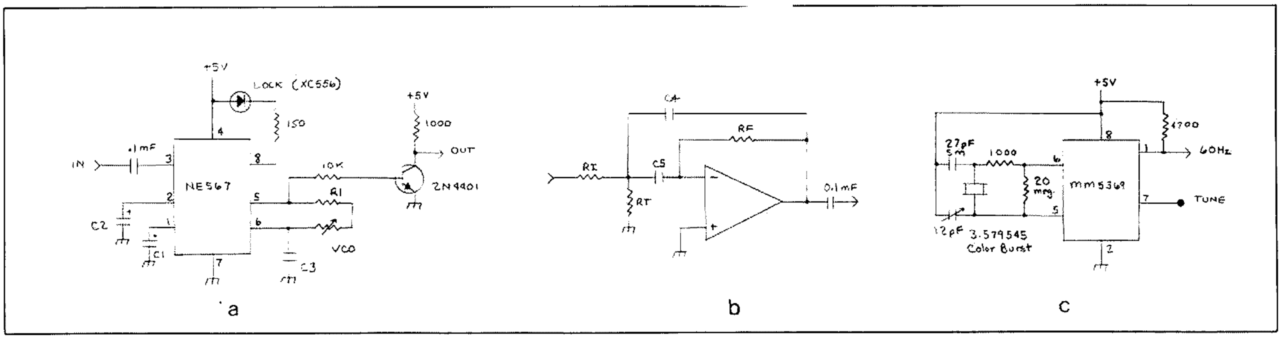

Fig. 1. (a) A PLL tone decoder; (b) the active bandpass filter; (c) precision 60-Hz source.

craft, whose line rate is *not* locked to the subcarrier frequency.

Usually the first upgrade of a subcarrier-locked station is to build a 2.4-MHz crystal oscillator and divide the signal by 1,000 to produce a steady 2,400-Hz tone for locking up the display. This is a major improvement but does require a stereo tape system (video on one channel, 2,400-Hz tone on the other). It is also not terribly convenient since 2.4-MHz crystals are special-order items and three divide-by-ten chips are required.

If you go this route, the 2,400-Hz square wave from the final divider should be routed through a bandpass filter—Fig. 1(b)—to convert it to a sine wave for better recording response. (Use the 2,400-Hz values from Table 1.)

Some cassette recorders may have a problem with this approach due to the fact that the left and right channels are adjacent to one another on the tape and quite close together. The problem is a beating of the two 2,400-Hz signals, as well as possible degradation of the black level on the video channel due to 2,400-Hz reference tone feedthrough.

In summary, I would recommend the direct subcarrier lock only if extreme economy were the object. If you designed around this approach initially, upgrading later to a 2.4-MHz/2,400-Hz system would be highly desirable whenever you could manage it. Given the versatility of today's digital circuits, there are better approaches to use right from the beginning that will actually result in a simpler system in the long run!

FAX Timebases

As noted earlier, the typical FAX system uses a 60-Hz synchronous motor that requires a precision source of 60 Hz ac at 110–120 V. The 110–120-V part is fairly easy, and a reliable power amplifier to run the drum is shown in the *WSH*. What is needed is a precise source for the 60 Hz to feed the amplifier.

You could get it from the subcarrier (see earlier discussion) or you could use a 6-MHz oscillator (crystal-controlled) followed by a division of 100,000 (five decade counters), but either approach is unnecessarily complicated. The circuit in Fig. 1(c) will do the same job with a single chip and a universally available color-burst crystal!

The 60-Hz output of this circuit is a square wave. That is not suitable for either drum motor amplification or recording, so this stage should be followed by the bandpass filter in Fig. 1(c) to produce a 60-Hz sine wave. (Use the 60-Hz component values from Table 1.) RT in Fig. 1(c) should be a pot adjusted for maximum voltage out of this stage with 60 Hz at the input. A similar stage should be used even if you use the subcarrier/crystal 2,400-Hz option.

For recorded operation, the sine-wave output from the bandpass filter can be routed to the reference channel of the tape system, which can be used to drive the drum amplifier on playback. There are several ways that the drum speed can be altered to provide for phasing in a system of this sort. A relay can be used to lower the drum amplifier drive level, dropping the drum out of lock, or a second oscillator can be used with a 4-MHz crystal with digital switching of the two sources for phasing. The latter approach is used in the *WSH* FAX recorder.

CRT/Scan Converter Timing

I have already noted how the direct lock and 2,400-Hz reference tone systems can be used to generate either 4-Hz or 2-Hz line trigger or scan converter timing pulses, but there is a much simpler way to accomplish the same task. A crystal-controlled oscillator can be operated at a frequency of 4.194304 MHz; the crystal is available from most parts houses for microprocessor use.

This frequency can be divided by 2,048 using a single CMOS chip such as the 4020. The result is a 2,048-Hz reference tone using only two ICs (a 74LS00 oscillator and the 4020 divider), compared with four ICs (oscillator plus three decade counters) required for the 2,400-Hz version.

The same bandpass filter and PLL circuit used for 2,400 Hz will work with 2,048 Hz, but this seemingly oddball frequency is far more versatile than the 2,400-Hz version. Assuming you have 2,048-Hz output from the PLL circuit, a single 4020 divider can yield either 4 Hz (divide by 512) or 2 Hz (divide by 1,024). You save a great many chips, the construction is correspondingly simpler, power drain is lower, and the crystal is cheaper by a factor of at least five! This approach is used for the CRT timebase in the *WSH* project for just these reasons.

Any system requiring a 4-Hz or 2-Hz trigger or timing pulse will also require a single shot at the end of the timing chain to produce a relatively short pulse (typically 10–15 ms) for timing or horizontal triggering purposes. The single shot output can also be fed back to a series of control gates to introduce a controlled time delay for either automatic or manual phasing, a subject covered in detail in the *WSH*.

The versatility of the 2,048-Hz timebase also extends to other approaches to scan converter timing. The *WSH* scan converter uses the 2,048-Hz tone directly without the need for additional dividers, single shots, or phase control gates. This clock frequency will toggle 512 times in each 240-lpm line (1,024 times for 120 lpm), making it a simple software task to store 256, 512, or 1,024 pixel samples during each line.

Precision phase delays in the ms range or extended time delays up to 32 seconds using a single 16-bit register are possible by simply counting 2,048-Hz lock transitions, greatly simplifying the scan converter timebase. By cheating unmercifully in the design of the *WSH* scan converter, the same reference crystal and divider

Component	2,048/ 2,400 Hz	60 Hz
Values for Fig. 1(a)		
C1	2.2 mF	20 mF
C2	4.7 mF	10 mF
C3	.1 mF	.22 mF
Vco	5k	25k
R1	1,500	75k
Values for Fig. 1(b)		
C4, 5	.01 mF	.1 mF
RI	10k	150k
RT	2,700	2,500*
RF	20k	330k

* = series variable pot for fine-tuning.
pF caps = silver mica.
Less than 1 mF = mylar.
Greater then 1 mF = tantalum.

Table 1. Component values for Fig. 1.

chain can be used for display timing as well! Such tricks are one of the primary reasons that the entire *WSH* scan converter circuit, including all satellite video, timebase, computer interface, and TV display circuits require only 13 ICs with a total component cost of about $60!

Timebase Adjustment

If a timebase is to do its job, it must be operating at just the right frequency. As you shall see in a moment, close is not good enough. The principal virtue of the direct subcarrier lock approach, aside from simplicity, is that the only adjustment to be made is adjusting the PLL for lock on the subcarrier. All of the other approaches require that a crystal oscillator be trimmed to a precise frequency. There are three ways to do this.

The first and most obvious approach is to use a frequency counter on the oscillator in question and adjust the relevant trimmer capacitor for the proper frequency. Don't bother with this one unless you are sure about the absolute calibration of your counter. If you are a few hundred Hz off in the 2–5-MHz range, you will get unacceptable results!

Your run-of-the-mill counter can be used, however, if you first examine the results of a live printout or display. The geometry of the display can give you all the information you need to get the oscillator on frequency regardless of the calibration of your counter.

Photo A is an example of a visible-light NOAA FAX print I received in the mail with an understandable "What's wrong?" query. What is wrong is that the clock frequency is off; but the question is, by how much?

Date	1 April 1987	
Spacecraft	NOAA-9	NOAA-10
Orbit Number	11844	2778
Eq. Crossing Time (UTC)	0054.19	0102.14
Longitude Asc. Node (Deg. W.)	147.59	82.33
Nodal Period (Min.)	102.0638	101.2979
Frequency (MHz)	137.62	137.50

These orbital parameters are projected two months in advance due to deadline considerations. Accumulated errors due to uncompensated orbital decay and other anomalies result in expectation of errors up to two minutes and possibly as many degrees in terms of the crossing data and possible small changes in the indicated period. Users requiring precision tracking data should rely on more current sources.

Table 2. TIROS/NOAA orbital predict data.

Note that the readout is progressively offset to the left from its initial starting position at the top. This indicates that the clock frequency is LOW. If the tilt had been to the right, the frequency would have been HIGH. Had the image been precisely vertical, the frequency would be right on (see the third option below), but then I never would have gotten the letter! OK, it's low in frequency. Now let's find out how low!

Using the trailing edge of the sync pulse, together with the minute markers (white horizontal lines in the pre-earth space scan), you start by physically measuring the offset over a specific time interval. In this case, the offset totals 14 mm (measured from the original print) over a period of 4 minutes.

Since the print width is 142 mm, the total offset error accumulated over 4 minutes is 9.86%—(14/142) x 100. Each line is 250 ms long, making the accumulated time error 250 x 0.0986, or 24.65 ms, over 4 minutes. Since 4 minutes is 240 seconds, you have an error of 24.65 ms/240 seconds, or 0.102 ms each second. This may not seem like much of an error, but it represents 0.01%—(0.102/1,000) x 100.

This particular recorder was using the circuit in Fig. 1(c) as the timebase, so the 0.01% frequency error represents 368 Hz—0.0001 x 3,679,545. You already knew that the frequency was low, so in this case you want to raise the clock frequency by 368 Hz.

Now comes the reason for all this calculator punching. No matter how well or poorly your counter is calibrated, simply hook it to the TUNE point in the circuit, note whatever reading you get, and then adjust the trimmer until it is higher by 368 Hz! This technique can be used with any display as long as you can measure the offset error over a known time period. All this requires is counter resolution, not precision calibration, since you are making a relative frequency adjustment.

The final approach, to be used if you have no counter but plenty of patience, is to make very *small* adjustments in your trimmer while looking at the results of live printouts or displays with each change. The goal is to get the printout precisely vertical, which means that everything is on frequency!

You must use live transmissions for each run since a recording will always preserve any error that was present when the recording was made and what you really want to do is check each adjustment against a live reference signal. Once properly adjusted, your recordings will also come out correctly since the reference frequency is now on the money!

Well, I have thoroughly run out of space this month, but at least I have made good on an introduction to timebases. Next month, I will look at the many aspects of image resolution, an often misunderstood subject!

Note

References to *WSH* refer to the third edition of the *Weather Satellite Handbook*, available from yours truly for $12.50 plus $1 shipping in the U.S. and $2 elsewhere.■

ABOVE AND BEYOND

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JANUARY SWEEPSTAKES

Funny, isn't it. Here I was, all set to tell you about my latest escapade up a snow-covered Catskill peak in a rare grid square during the January VHF Sweepstakes, carrying complete stations for 144, 220, 432, 902, and 1296 MHz to make countless operators happy by giving out contacts from FN22. There would be the usual photos showing the trek up the mountain, setting up, and spectacular vistas in the background, while I was furiously logging contacts at one per minute.

What I am actually going to tell you about is a difficult three-hour trip up a two-mile road into 60-mph winds and a −30° wind chill, the almost total destruction of my F9FT 432 yagi, snow blowing into everything, one lousy contact on 220 MHz FM, and a fast retreat to (of all things) a nearby UHF-TV transmitter site to warm up and then hitch a fast ride down the hill on a Snowcat accompanying one of the crew after a minor accident.

Overlook Mountain (elevation 3,150 ASL) is about 10 miles northwest of Kingston, New York. It is an excellent VHF location and sits right on the southern edge of grid square FN22, with a commanding shot to the north, east, south, and southwest. Only the paths from 270 degrees to 360 degrees are difficult. It is just north of the legendary "activity corridor" that runs from Boston to Washington and lies close to several major population centers with lots of VHF activity.

What better time to put it on the air than during the January Sweepstakes? The mountain's usual occupants, John Lindholm W1XX and crew, had announced their intention to travel west to FN01 in western Pennsylvania instead, and I couldn't resist the temptation. Stations were quickly assembled for 144, 220, 432, and 1296 MHz, using the notorious TR-9000 as both transceiver on 2 meters and transverter exciter for the higher bands. I selected the IC-3AT for 220 FM, and Hans Peters VE3CRU sent along a review model of the new SSB LT33S 902-MHz transverter to take along.

Antennas were the trusty 19-element 432 F9FT, the 23-element 1296 F9FT, and a new 18-element 902 F9FT. In addition, Ivars Lauzums KC2PX provided one of the new 9-element portable 144-MHz F9FT antennas, wherein the elements collapse against the boom for transportation. This made for a neat package. I tried a radical idea with coax feedlines: Everything used RG-8/X "mini-8" to save weight and size. How much loss did I give up? About 3 dB in the 1296 run, 2.5 dB at 902, and 1.5 dB at 432 MHz. These were figures I could easily deal with, since I could negate the loss-

es just by being at 3,150 feet. Unusual thinking, but it did save weight in the long run.

Once again, the power source was to be the trusty motorcycle battery, with special power cables and harnesses made up for the various rigs. I brought along two batteries for the IC-3AT, as well as a separate whip antenna. No plans were made for 50-MHz operation; otherwise, I could have brought a 220-MHz transverter with 6-meter i-f stage as well. Along with support materiel (clothes, food, hot coffee, tools, log, and pencils), the entire package weighed in at 60 pounds—not bad for a 5-band operation running about 8 to 10 Watts per band. The plan was to access the top between 10 and 11 a.m., operate for about three to four hours, and begin the descent at about 2 p.m., depending on the weather. I dutifully got on the local VHF nets and notified everyone I could think of to look for me on Sunday morning and "work that rare grid."

I should have known I was in trouble when the Microwave Modules MMT 432/144 transverter (which regularly self-destructs right before one of the mountaintop operations) gave me no trouble whatsoever in pre-pack tests, right up until Saturday evening! At one point, I even forgot to put the 15-dB transceive pad in-line and accidentally blasted the input with 10 Watts for a second. No problem—it just kept ticking along at 10 Watts output. Not only that, the synthesizer in the TR-9000, which refuses to lock up from time to time in inclement weather, was as happy as a pig in slop. Not a good omen!

We concluded a grand birthday party for my son Ross (who readers of this space will remember was born one year ago during this same contest) on Saturday evening, and I checked with my brother Miles near Kingston to get a weather report. Yes, it was snowing, he said, but it looked as if it might taper off. The only hitch from NOAA weather was a forecast for high winds on Sunday. Oh, what the heck, the worst that could happen was that I'd drive the two hours and have to call it off and come home again.

I drove up through mostly freezing rain Saturday evening and arrived about 11 p.m., armed with two sets of dry clothes, a fresh battery, food, and a thermos of red-hot coffee from the party. Little did I know how handy that coffee would come in later! After we

Back down at the trailhead at the end of the ordeal, the entrepid KT2B contemplates other mountains to climb and a hot bathtub, though not necessarily in that order. (Photo by Miles Putman.)

exchanged pleasantries, I set the alarm for 6 a.m. and hit the sack.

All too soon it was time to get up. I checked outside the apartment; all was still. The air temperature seemed to have warmed up, and no snow was falling. Miles and I agreed to give it a shot and at least drive to the base of the trail, which proved to be more difficult than I had expected! My Honda Civic has front-wheel drive, but it just gave out halfway up Mead Mountain Road to the trailhead. While contemplating how to attack the grade from the other direction, I was suddenly staring in the face of a New York State DOT snowplow bearing down the mountain, hurling sand and salt every which way and threatening to plow me right into someone's mailbox.

"I was suddenly staring in the face of a New York State DOT snowplow bearing down the mountain, hurling sand and salt every which way and threatening to plow me right into someone's mailbox."

We executed a nifty series of turns, driving backwards at about 25 miles per hour in the wrong lane for about a half mile until we found a secondary road, and quickly backed out of the monster's path. After the plow roared by, I found the road was now quite tractable, and in no time we accessed the top and trailhead. Light snow was falling, but the air temperature was still in the 30s, so we saddled up the equipment and shoved off. Note that by now I had scuttled 902 to save weight, feeling that the few contacts I might make wouldn't be worth the time spent. (Sorry, you 902 fans!)

The trek was quiet. About 1/8 mile up I realized I'd forgotten the keyer, and went back to get it, probably adding another 15 minutes to the climb. About halfway up we started to notice that the power lines along the road were oscillating—a sure sign of wind somewhere near the top. Yet it was as calm as a summer day where Miles and I stood, with light snow fluttering to the ground. We paced ourselves slowly and about a 1/4 mile from the top the wind started to really pick up. At that point, we were passed by a Snowcat carrying about six folks, and my question "How far to the top?" was met by the answer "Follow the telephone poles!" Useful information, indeed.

Shortly thereafter we crossed the saddle of Overlook Mountain at 2,800 feet and checked the map. According to it, we should have been standing by some sort of ruins, but all I could see were trees and the road stretching ahead. I thought it was off to the right, but Miles—a pretty good map reader and geologist in his own way—insisted we continue up the road. He was right, for shortly afterwards the ghostly stone walls of the Overlook Mountain House loomed directly ahead of us. So, too, did the 200′ tower of WTZA-TV, and we were greeted by some pretty stiff winds.

After climbing to the hotel ruins, we noticed the large transmitter housing behind it and I knocked on the door to make inquiries as to compass directions (of course, I'd left mine at home!). The chief engineer was a friendly fellow and determined that the rectangular ruins of the hotel ran east-west with a southern exposure. That was a big help. Unfortunately, we couldn't see the fire tower (1/2 mile further) at the very top of the hill, due to the increasing amount of snow being kicked up by the wind.

After determining my purpose for needing compass directions, the chief engineer scoffed at making any serious distances at 1296, let alone 432. "The snow alone will attenuate your signal so badly you'll be lucky to get into Kingston!" Well, we hams are bullheaded at times. I suggested to Miles that we take a look at a rise above the hotel, and lo and behold found the trail to the fire tower. At this point the wind was really gusting, but I thought we could give it a shot and Miles agreed.

After some assembly, I pulled out the IC-3AT and called a quick CQ on 223.50 simplex, immediately working KF6AJ in Connecticut. He asked me to go to 1296, but at that moment the partially assembled 432 yagi and 10 feet of mast stuck in the snow was launched through the air about 20 feet by an amazing blast of freezing cold air. Then I realized we were standing in the middle of some sort of localized blizzard, and couldn't even see the hotel (200 yards away), TV antenna (150 yards), or even our fresh tracks made barely 10 minutes earlier. Miles was trying to construct a windbreak from the sections of the F9FT portable antenna and a poncho I brought along, but had no luck and was starting to really feel the cold in his extremities.

At this point, several thi..gs became very obvious to me: (1) I was going to be very lucky to work anyone on 1296 because of the precipitation attenuation. (2) The 432 antenna coax had actually frozen and broken off from the impact of

the wind blast. (3) The TR-9000 would probably refuse to lock up in such cold temperatures. (4) All of the type-N fittings were filling up with snow and water faster than I could dry them out. (5) If we stayed up here much longer, Miles and I would probably wind up in the frozen vegetables section of the local market.

As if I needed a clincher, Miles turned to me and said (in the best tradition of Bob Uecker), "Hey—great seats, buddy! Where's the rest of the gang? They're missing all of the fun!" That did it. He was starting to go insane. "Let's get the ndshndshndshndsh off this mountain!" I shouted. "Good idea!" he replied. We threw everything into a hodgepodge of antennas, masting, cables, guy rope, and equipment, and literally tumbled down the rise to the transmitter shack, where I proceeded to pound on the door vigorously.

The engineer's face greeted me. "Having a nice hike, fellows?" he asked. I inquired as to the possibility that we be allowed to come inside for a minute and warm up enough for the trip down. He obliged us, and I wound up getting a guided tour of the 250-kW transmitter facility. Seems they were also having their problems with the weather, and the crew was trying to repair an air waveguide to 1-5/8" hardline transition at the antenna—just 200 feet above the mountain in what was now a howling blizzard.

What made things worse was that the crewman at the top either lost power to his Motorola handie-talkie or wasn't listening as his friends below tried to call him off the tower and wait out the storm. Next, someone managed to drop a come-along wrench several feet down the tower onto the head of another crew member, who was brought inside with a nice gash in his scalp. I quickly brought out the still red-hot thermos of coffee (which we had been gulping up on the ridge) and offered him a cup, while the engineer brought him out a blanket and a pillow to lie down on.

The decision was made that this poor fellow would have to go to a local hospital for observation, so the engineer gave me the equivalent of the old western movie cliche "There's a train leaving town in half an hour. Be on it." Except that our train was a Snowcat. Miles and I didn't care—we were just happy to have the ride. Soon enough, we were roaring down the same road we had climbed up, except that the blowing snow had now come around to the south face of the mountain and hit us full force. Also, a Snowcat's treads throw up an awful lot of snow, especially if you happen to be riding on the back. We were soaked by the time we reached the bottom around 1:30 p.m., with only one contact to show for it!

After drying off at Miles' place, we caught a late lunch at the pancake house in Kingston and watched the television tower 10 miles away on Overlook disappear and reappear every ten seconds in the snow. The storm front bringing all of this wind and snow was parked right along the ridges in the Catskills! No doubt that poor fellow was still up at 200 feet trying to secure that transition, since no one was able to get his attention by the time we had left the hill. Afterwards, I dropped Miles at his apartment and drove home, arriving at 6 p.m. just in time to watch the end of the Giants playoff game, grab a quick meal, and get on the last three hours of the Sweepstakes.

Well, there you have it. If there's a lesson to be learned, it's that no one can ever underestimate the severity of the weather at the tops of these peaks—even those smaller hills around 3,000 feet. Was I discouraged? Sure. But I'll try it again next winter, except that I'll be better prepared for the weather. At least I had a nice hike on the way up. And it isn't every day that you get a guided tour of a UHF television station!

Letters Dept.

Walter Stringer N8BSG writes to ask how he can attempt to make skeds to work stations on 10 GHz either near his home in southeastern Michigan or from a mountaintop expedition. Walter is using converted TR-6 police radar units, running wideband FM on 10.25 GHz and 10.28 GHz. Walter, I suggest you contact the various specialty newsletters for VHF, and one good choice in your area would be the *Midwest VHF Report*, published by Roger Cox WB0DGF, 3451 Dudley Street, Lincoln NE 68503. A year's subscription costs but $10 and may help you line up those needed skeds.

Kevin Neal (HCR 62-222, Flippin AZ 72634) writes to inquire about a schematic for a Boonton 91-27 probe for a Boonton 92 meter. Kevin, my probe is a 91-12F so I can't help you out, but perhaps one of our readers can? These probes do pop up on the surplus market, and I would suggest trying Brian Kent at Kentronix (PO Box 2444, Allaire Airport, Farmingdale NJ 07727), as he may be able to help you. . . Until next month, see you Above and Beyond! ■

ATV

Mike Stone WB0QCD
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Lowden IA 52255

THE N9CAI ATV/R SUPER SYSTEM

This month, I'd like to talk about what an organized, cooperative, positive-thinking ATV group of about 10–20 people can accomplish in just a few years. I speak from personal experience on this subject. In the entire state of Iowa and extreme NW Illinois, there was zero FSTV activity in 1979. Today, there are more than 100 active stations.

Our now 30+ member group, called the B.R.A.T.S. ATV Group (Big River Amateur Television System, not to be confused with the Baltimore BRATS ATV Group), does not meet weekly or monthly. We are lucky if we have two or three official meetings a year. On ATV, you see, you don't have to do what other clubs are required to do. We "see" each other all the time!

We do hold a regular ATV net on Sunday evenings at 8 p.m. in conjunction with a long-standing 2-meter FM net. It gives us a regular time and meeting place to catch up on all the week's activities. A regular net also constantly exposes the mode to non-ATVers. Newcomers will come at you right out of the woodwork!

Our ATV group sponsors three amateur repeater systems and one remote transmitter:

1) The N9CAI ATV/R UHF fast-scan TV repeater (mode B) takes inputted video signals on 439.25 MHz and passes them out (without desense) in band at 421.25 MHz. This system accepts standard 3.58 colorburst NTSC video and 4.5 MHz audio FM subcarrier sound.

2) An auxiliary audio feed (not link—there is a difference) is fed from 144.340 MHz FM simplex and goes out the TV system at 425.75 MHz.

Photo A. WB0QCD in Iowa as seen at WB0ZJP in St. Louis, Missouri—200 miles away.

3) The remote transmitter (mode A) part of the system outputs at 421.25 MHz as well.

4) The N9CAI-1 packet radio digipeater accepts AX.25 protocol at 145.01 MHz FM. We have a videotape feed off this source as well, which can be called up on the main ATV/R system.

Yes, it sounds complicated, but you get used to it in a hurry around here.

Shown in Fig. 1 is a block diagram of the N9CAI ATV repeater, remote transmitter, and packet radio digipeater system located at St. Ambrose College in Davenport, Iowa. This system is unique because it has nine TV video feeds to choose from in mode A. These feeds were brought to us in part by Tracy Monson N9AEP and his diversified home-brew touchtone™ command systems.

- Channel 1—NTSC colorbars or a "live" on-campus television center production feed. We watch basketball games, football games, football replays, stage plays, VCR editing, and other self-programming.
- Channel 2—A Radio Shack (Tandy Corp.) 64K TRS-80C Color Computer with disk-driven Mul-T-Screen (cable-TV type) ATV bulletin board software. I keep it updated every Friday. The troops use it constantly.
- Channel 3—A "live," moving B/W Hitachi "security" and shack camera.
- Channel 4—A FSTV window.
- Channel 5—Our packet radio feed from VHF. Even those mem-

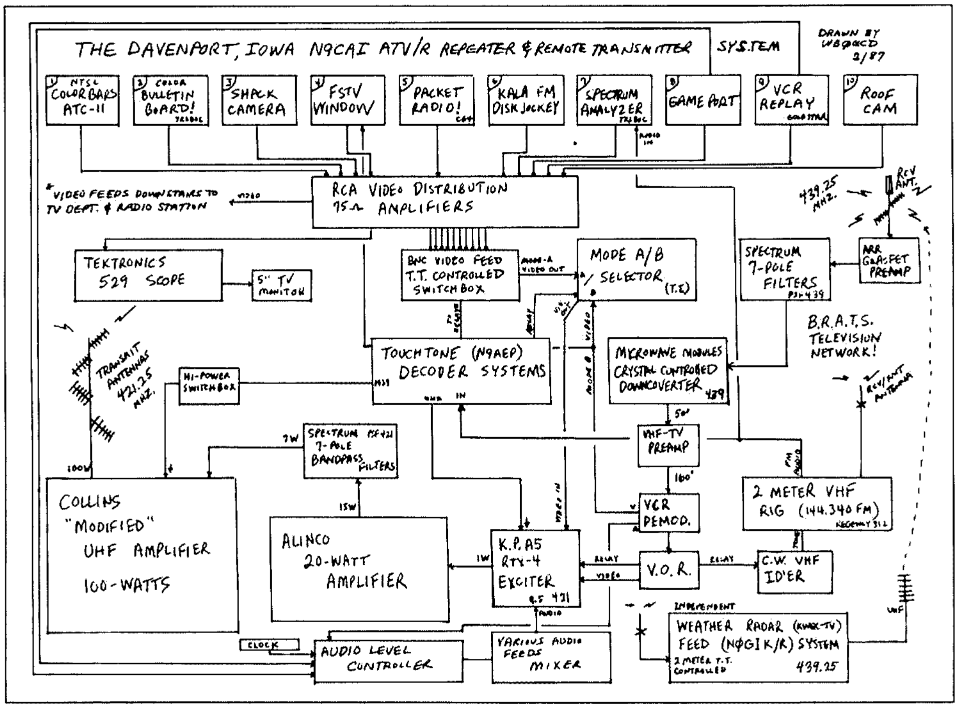


Fig. 1. The Davenport, Iowa, N9CAI/R repeater and remote transmitter system.

bers not involved in packet can watch the fun.

•Channel 6—Another "live" B/W camera watching the college's KALA-FM radio station disk jockeys do their thing. We "tune" 88.1 and listen to the station, as well as "see" the student spinning the wax. One of the Ambrose DJ students is also a club member and a ham (KAØGOA). The other night, we called him on his phone to let him know we were all watching him, and he held up a sign that said QRZ CQ-ATV. It was great!

•Channel 7—Another 64K CoCo using a ROM pack spectrum analyzer program that graphically shows your input on 2 meter FM.

•Channel 8—One of the "hottest" channels! It is our gameport feed. Four (interactive via 2-meter-FM touchtones) games are available to play: Joker Poker, Dice, Horse Race, and Blackjack.

There is, of course, no real money used in this entertainment channel. To drop in a quarter (members only), you hit TT#8 on your 2-meter rig. Other numbers control the actual play of the game. High scores into the multi-billions are recorded and saved in memory along with the callsign of the top seven finishers per game. Competitiveness is high, and each day brings a new leader. We reset all scores about every two months. This, as far as we know, is the only such "interactive" amateur system in the country—perhaps in the world!

•Channel 9—Our latest addition. I took an "on sale" Gold Star VHS VCR player ($160) and had Matt Reed NØGIK (our resident solder junky) modify it for automatic rewind, restart, and play hold. We run all kinds of taped programs—special events, Field Day stuff, ATV DX replays, lectures, bloopers, etc. The audio is also fed so all can hear. Future feeds include an outside camera and a soon-to-come, authorized weather radar feed from nearby KWQC-TV (NBC affiliate).

As mentioned, all nine TV video feeds make up what we call mode A. Mode B is the actual fast-scan TV signal repeater. The system employs a P.C. Electronics RTX-4 transmitter (Kreepy Peepie KPA5 1-Watt exciter), which drives a small Alinco amplifier to an output of about 15 Watts. The 15 Watts (TT-selectable ON/OFF) then drives a larger modified Collins UHF aircraft 4CX250B single-tube, high-power tube amplifier for about 90–100 Watts "average" output. The large Collins amp is preferred over a Mirage-type transistor one due to long periods of keydown time and better color.

The signal passes through about 90 feet of Andrews 7/8-inch, 50-Ohm hardline (with brass connectors) to our split 4-KLM (6-element) beam array. Our group has tested many types of horizontally polarized antennas for the best omni-directional patterns with respectable gain, and the beams have given us the best performance. Each A440-6 KLM beam has a 60-degree beamwidth pattern and 7.6 measured dB of gain.

We cover all areas with absolutely closed-circuit, P5 color TV pictures, out to about 40–50 miles (if you do your homework on the other end, of course). We estimate a genuine 100-mile coverage radius on this system, which is remarkable for UHF, let alone a television repeater.

There are a number of published antenna designs (such as stacked big wheels, slots, etc.) that perform well for those ATV groups now using horizontal polarization and desiring to remain that way. As stated in my previous columns, disrupting polarizations in established areas can mean DEATH to ATV activity. You've heard that lecture before, so I won't go into it again. If you need some further information on these types of antennas, write to Gerald Cromer K4NHN in Cayce, South Carolina, or drop me a line.

On receive, we use a simple W9DNT Alford Slot antenna with a couple of KLM 440-6 beams as kickers to bring in a couple distant and weak-signal areas. An Advanced Receiver Research GaAsFET preamp is ahead of a 7-pole Spectrum International inter-digital bandpass filter and a Microwave Modules crystal-controlled downconverter, which has a 45-MHz i-f rf output. Another line preamp is used (Channel Master VHF-TV 10-dB model) about 50 feet into the run, which travels over another 160 feet of Belden 9913 to our transmitter room.

Everything is mounted near the antenna in a milkbox-type weatherproofed container at the foot of our second tower tripod/mast arrangement. There is approximately 75 feet of horizontal separation between the transmit antennas and the receive antennas. It took filtering and proper cabling on both ends to keep the extra 85 Watts of "natural desense" out of incoming weak pictures. Contrary to a lot of negative predictions by some, the system works and works well!

A special P.C. Electronics VOR circuit board senses the presence of video TV sync (not radio carriers) and automatically turns on the "repeat" transmitter. Surplus RCA broadcast distribution amplifiers set the proper levels on all feeds on mode A, including the FSTV input on mode B. A Tektronix 529 Waveform Monitor Scope is used on-site to keep everything in line.

Our whole system is housed on a third-floor room, just above the FM radio station, within the college complex. Electricity is provided us at no charge and we can come and go to the system as we please. It is a nifty arrangement for which we owe thanks to our member sponsors, N9CAI and WDØAMA. Stop by our ATV workshop session on Saturday night at Dayton (see below) to see this system on tape in action.

Dayton ATV Workshops

You are invited to join other fellow USATVS members at our special ATV workshop meeting/conferences sponsored jointly by the *Spec-Com Journal* and the Chicago-based Peacock ARC (a club of prominent TV and radio broadcast amateurs) to be held this year during the upcoming Dayton, Ohio, Hamvention.

The location of these informal, social get-togethers has changed from previous years. We will be at a large two-room suite at the Ramada Inn North, 1/2 mile south of I-70 and I-75 in north Dayton (4079 Little York Road, Dayton OH 45414). Ask for Beth if you call (513-890-9500) to make room reservations ($60).

Attend all the doings at the Day-

ton Hamfest on Friday and Saturday, and then come rest your feet and learn more about amateur radio fast-scan television at our sessions. $1 will be asked at the door both days to cover the expensive "extra" meeting room.

Friday's ATV workshop is from 7 until 11 p.m. It will be an informal get-together rag-chew session, with all the various groups of ATVers from around the country showing off their edited color VCR programs about their local activity, repeaters, remote transmitters, DX, clubs, special events, etc. Bring your latest, uncensored commercial TV bloopers. Keep the XYL and kids at home or back in the motel unless they won't mind a lot of boring technical conversation.

We will try and have an operating FSTV station on the air possibly into the Dayton ATV repeater. Vertical polarization will be used on UHF. The 2-meter ATV input channel there is 147.450 FM. We will be there or on 144.340 MHz. How many ATV mobiles will show up once again? We will award a $19.95 Hamfest Game to every mobile that makes it (must be verified at the Ramada or Dayton Hamvention location).

Henry Ruh KB9FO (former Editor of *A5 ATV*) of the PARC group will present an update and film of the new Chicago 1,350-foot high John Hancock Building KB9FO ATV/R system around 9 p.m. (See "Repeater Update" below.) It should be quite an interesting and relaxing night.

On Saturday, the ATV workshop doors will be open from 3 p.m. on. Formal ATV lecture presentations will begin promptly at 7. At 7:30, I will speak and show a videotape on the fancy Davenport, Iowa, N9CAI ATV repeater system. At 8:30, our special guest speaker will be John Beanland G3BVU/W1 of Spectrum International, Inc. If you haven't had the opportunity to hear John lecture, you are in for a real treat. He will speak on the importance of good inter-digital bandpass filtering in the 80s. Bring your notepad!

Other Dayton ATV events include the annual 7 p.m. WØLMD/W9NTP Saturday night SSTV get-together at the Holiday Inn North and the Saturday afternoon (1300–1445) Dayton ATV Forum meeting held by Tom O'Hara W6ORG. The forum will include a talk on ATV basics, a talk by Gary Heston W6KVC on portable ATV applications, and a talk by Bruce Brown WA9GVK/4 on FM ATV, standards, comparisons, and equipment. Don't forget to stop by and see the P.C. Electronics and Wyman ATV booths as well.

Repeater Update

Last month, I talked about the new PARC Chicago ATV repeater announcement. The latest news is that the transmitter is being located up on the John Hancock building—not just on the top floor or on the roof, but two-thirds up the left side tower, with 1,350 feet of antenna height and three feet of coax. Way to go, guys! Look for it in the Midwest—120 Watts of rf on 421.25 MHz—especially during band openings.

Henry got permission from The Kavouras Company and WMAQ-TV (where he is employed) for a weather radar feed. Chicago ATV is "on the move" again after being dormant for several years. Old timers, watch out for the newcomers. The old, do-nothing days are over. If you live in or near Chicago for about 100–150 miles, you may want to get an ATV downconverter or build an antenna because now there is something more to watch than just postcard IDs, weak attic colorbars, and questionable channel 7 TV feeds.

ATV Directories

Many of you have written wanting to know more information about the *North American USATVS ATV Directory* and the *1987/88 ATV Repeater Directory*. For more information about these directories, write to Spec-Com Communications & Publishing Group, PO Box H, Lowden IA 52255.

Special Offers

73 ATV fans, you can get a special "get started" FSTV incentive deal from P.C. Electronics (2522 S. Paxson Lane, Arcadia CA 91006; 818-447-4565). Their popular TVC-2 420-450-MHz (channel-3 output) ATV downconverter circuit board—built and tested, but minus the cabinet—regularly $49, is now just $39! The finished unit, a TVC-4, comes all ready to operate in an attractive Ten-Tec-style box with 110 V ac supply—regularly $89, it is now just $74! Simply mention this special *73* magazine "ATV Column" offer or purchase this gear at Dayton from booth #359 to get your discount. ■

73 INTERNATIONAL

NOTES FROM FN42

Correction: In Ralf Beyer DJ3NW's report on the beacon robot, IY4M (February, 1987), the bandwidth of the receiver should have read: "about ± 250 Hz," and NOT ± 2590 Hz.

Welcome to Djurica Maletin YU7DR, writing from the Socialist Federal Republic of Yugoslavia, and inviting hams to come work from YU: ". . . a very nice country [with the] blue sunny Adriatic, high mountains. . . national food [which] is very tasteful and wine pleasant to drink. Our people are always hospitable." Only a sample of information this month.

This seems to be the month for royal birthdays, including one for the "King of Code," Samuel F.B. Morse (April 27, 1791). In your DXing, remember to send birthday congratulations for the Queen of Denmark (16th), the Emperor of Japan (29th), and the King of Sweden (30th). The 30th is also Queen's Day in the Netherlands. It is Independence Day in Senegal on the 4th and in Zimbabwe on the 18th; Republic Day in Sierra Leone is on the 19th and National Day in Chad is on the 13th, which also is New Year's Day in Bangladesh. The 14th is Pan American Day (Dia de las Americas). And XYLs, the 7th is Womens Day in Mozambique. It is World Health Day everywhere on April 7, so wish everyone, everywhere *the best of health in mind and body! After all, one of the four basic reasons radio amateurs are licensed is To Foster International Goodwill!*

ROUNDUP

Japan. We were pleased to receive a letter from Shozo Hara JA1AN, president of the Japan Amateur Radio League (JARL), promising this column amateur radio information from Japan from time to time. An international column in a ham radio publication without any input from Japan is ridiculous! We hope to do a better job than we did a few years ago.

HAMBIT. Billed as the "First International Congress on Amateur Radio and Computers," HAMBIT was held in Florence, Italy, last November. HAMBIT '87 will be on November 22; details are under the Italian flag, below, since the Associazione Radioamatori Italiani (ARI) sponsors it.

Diego Garcia. Bill Poulin KA4WWG/MM writes to encourage hams to bring their equipment "for a DXpedition for 12 months that they will never believe." Well, first you join the Navy. . . . Diego Garcia is a U.S. Navy support and communications facility in the middle of the Indian Ocean (VQ9). Using the club station, an ICOM 745 and a TH7 beam up about fifty feet, "the bands are really fun to work," he writes. He worked Guam, the Malaysian Peninsula, Europe, and a few stateside stations. Full operating privileges are yours "regardless of current stateside license." More info on Diego Garcia is available by writing: Station Manager, Diego Garcia QSL Bureau, Box 15, NAVSUPPFAC, Fleet Post Office, San Francisco CA 96685.

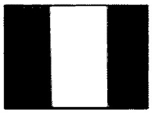
Africa. "By the early part of the next century virtually the whole of mankind should be brought within easy reach of a telephone."

That was an objective set by the Independent Commission for World Wide Telecommunications Development, which led to the "Arusha [Tanzania] Declaration," which led to discussions about African Telecommunications Development by the pan-African telecommunications network (PANAFTEL). A common strategy is to be developed for extensions of current cooperative efforts in the fields of training, research and development, purchasing policy, maintenance, tariffs, and the international development priorities for the continent. (Excerpted from the December *ITU Telecommunications Journal*, the magazine of the International Telecommunications Union). Talk about challenges!

(The ITU—for readers new to this column—is an autonomous organization, with functional relationships with the United Nations, located in Geneva, and with a membership of 159 nations. Its function is to set up international regulations of radio, telegraph, telephone, and space radio-communications, and allocate radio frequencies. The magazine has a history a bit longer than that of the United Nations. The December issue includes this, from the *Journal Telegraphique* for December, 1886: "The Imperial Telegraph Administration of Brazil has recently opened a telegraph office in the quarantine station of Ilha Grande to the South of Rio de Janeiro." (A new DX country?)

A new plan for FM broadcasting in band II, to go into effect July 1, this year, was drawn up in 1984 for the whole of Region 1 (Africa and Europe, including all of the USSR, Turkey, and the Arab countries of the Middle East) and Afghanistan and the Islamic Republic of Iran from Region 3. In Nairobi recently, a new plan was drawn up for television broadcasting in the frequency bands I, III, IV, and V. A report on that will be in this column in the future.

World. Better and faster: That's the word for what will be available by 1990 for communications across the Atlantic and Pacific Oceans with fiber-optics—glass fibers and laser beams in underwater cables. Audio quality will be superior to both the present copper cable system and satellite system—and faster than via satellite since Earth-bound channels are 45,000 miles shorter. The Atlantic cable is scheduled for operation next year and the Pacific, the year after.



FRANCE

Chuck Martin F/AB4Y
American Embassy Paris
APO NY 09777

A veritable explosion of packet radio activity is underway in the French Republic. Remy F6ABJ, the "guru" of packet, said that his company had originally built 200 boards for packet. The demand has been so great that 600 units have been built and the demand is still increasing. He has started the association called ATEPRA; there are about 190 in the Paris area that are active in packet.

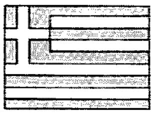
The propagation characteristics on 14 MHz are such that only one 20-minute window opens each day where communications with the USA are possible.

Three frequencies are used for packet communications in Europe: 144.675 (primary), 144.650 (secondary), and 166.625 (tertiary). These frequencies were chosen arbitrarily, and while they have proven adequate in their own right, it is difficult or impossible to co-locate a digipeater with an FM repeater, due to heterodyning and desensitization.

Packet radio is not addressed in the French amateur radio regulations. There is a *modus vivendi* wherein amateurs may operate packet legally. There is no 220-MHz allocation in Europe, so plans are underway to cross-link digipeaters on 430 MHz. In the future, there will be a 50-MHz allocation in France.

Paris has two active digipeaters: F1KAL and F6ABJ-2. They permit a Paris station to work stations within a 125-km radius. I have connected with stations from Rouen to Orleans. There are two active PBBS systems operating: F6ABJ and F5LO. Another digipeater will soon appear: FF6KEV. The future looks very bright for packet in France, with new stations appearing every day.

Reciprocal licenses for foreigners are now made "over the counter" in France. The Republic has reciprocal operating treaties in force with some 30 nations. A 90-day permit can be had for a fee of FF 42 [$0.16 per French Franc as of 1/27/87], and a one-year permit costs FF 150.



GREECE

Manos Darkadakis SV1/W
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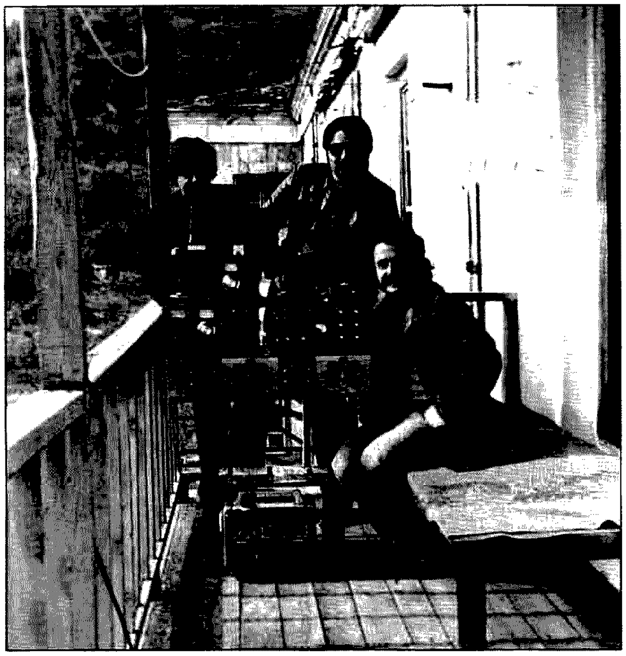
11210 Athens
Greece

I would like to welcome the return of Wayne Green to the magazine! Since this column is written months before it appears, it may look a little old, but it is necessary to say because, even though I don't know Wayne Green in person, I think this was the best thing happening to the magazine for the last two years. Since I also believe that everybody has to be in proper position, I am glad to see W2NSD back in charge of *73*.

THE *ABEPΩΦ*

Last July you may have heard a strange callsign, SX1MBA, on the air for seven days, working the pileups all day and all night long. This call had been given to the Radio Amateur Association of Greece (RAAG) during the celebration of Navy Week. The station was in the radio room of the Memorial Battleship *Abepωφ*; that is where the MBA suffix came from. Here is the story, from recent Greek history:



The 1980 SV1DC/SV1IW/SV1JG operation on the back balcony of the Monastery, with all equipment.

At HAMBIT '86, left to right: Mario I5WBJ, Clelia I5ICY, Mr. Giani, Mr. Spina and Mr. Poli of the Italian Telecommunications Ministry, Carlo I5CLC, Marco I5ZMH, Cesare I5TGC, Mario I5DEX, and Francesco I5IGQ.

After the signing of a peace agreement between Greece, Serbia, Bulgary, and Montenegro on November 20, 1912, Turkey was starting to prepare an expedition to the Aegean Sea to defeat the Greek navy and occupy Greek islands.

This was noticed by a Greek squadron, and the fleet began to patrol on the Dardanellia Sea to watch for the Turks. Action began December 3 when the Turkish fleet came along the strait. The *Abepωφ*, with a speed of over 20 mph, left the Greek fleet and circled around and attacked the flank of the Turkish fleet, firing many successful shots. As the rest of the Greek fleet came up under cover of the fire from the guns of the *Abepωφ*, the Turkish fleet retreated. In less than three hours the fight was over: It was a victory by almost just one ship!

SX1MBA ran on this ship, the *Abepωφ*, for seven days on all bands and all modes. There were HF stations as well as VHF for the local people. RAAG equipment was used; lots of other SV1s offered tuners, power supplies, keyers, switches, and even keyboards for RTTY. Simple dipole antennas were used on all bands, and special attention had been paid on CW and the low frequencies. By the end of the week, 9,000 QSOs had been logged.

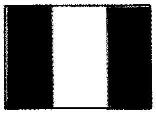
A nice-looking QSL card with a photo of the ship was developed, as well as a special award for 10 IRCs, from RAAG's Award Manager. Those who have already applied should have them by now [in March].

MT. ATHOS AGAIN

By the time you read this, you should have heard about a new failed attempt to activate Mt. Athos, last August, by an Italian group. I won't go into detail (although I know many details) since it was covered in this column before, and I do not want to bore you. [November, 1986, issue; *but here is a picture we did not use in that issue.*] Also, the circumstances of this attempt were not so different except for one thing: This time, the Italian group made sure to leave very few chances to anyone coming along later for a try. Now for those who still need this rare country, things aren't so easy and only time will tell who is to be blamed about it. DL7FT and the Italian group may have shut the doors of Mt. Athos forever.

In the meanwhile, work anyone you hear claiming to be from there and worry later about its validity.

Medical Administration Radio, station J4MAR, was established recently in Greece in order to give medical help to those who need it. RAAG is providing QSL service for its members completely free of charge.



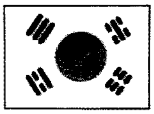
ITALY

Further information on HAMBIT may be obtained by sending an SAE and IRCs for an airmail stamp with your request to Carlo Luigi Ciapetti I5CLC, Via Trieste 36, 50139 Florence, Italy.

Florence, Italy, the "Capital of European Culture," played host to 250 representatives of the high-tech world on Sunday, November 23rd last year, thanks to the sponsorship of ARI, the Italian Telecommunications Ministry, EXPOSER (one of Italy's big fairs), and the Florence Savings Bank (Cassa di Risparmio Firenze). Papers were presented by representatives of Germany, the Netherlands, Sweden, Switzerland, and Italy, on subjects ranging from dedicated software through digital modulation and application and data radio transmission, to data security. A general overview of the field was presented, from the latest high-tech developments to current research into the high tech of the future. Carlo I5CLC, president of the Florence branch of ARI, organized and coordinated HAMBIT '86.

Presiding at the opening session was University of Florence Professor Vito Cappellini, director of the Italian Institute for Radio Wave Research; welcome was extended by the President of the Italian Republic, Francesco Cossiga IØFCG.

HAMBIT '87, to be on Sunday, November 22, this year, will focus on PC-compatible hardware and software for amateur radio.



REPUBLIC OF KOREA

Our guest columnist, Byong-joo Cho HL5AP:

Not having heard from our Korean correspondent, HL1AFP, for several months, here is a guest appearance to fill in for him.

You may be surprised to receive this letter from an unknown Korean amateur radio operator, but I got your name and address from the KARL DX News (the official bulletin of the Korean Amateur Radio League) [in which *73* said it would welcome news]. I am a charter and life member of KARL since it was organized way back in 1955.

I wish to be a news supplier for you. I am retired from the ELØAP/MM last June (Sanke Steamship Company, Tokyo) and was ex-HM1AP, HM9AP, HM5AP, ELØP/MM, PA9SR, HM5AP/DL, and YBØZAA/HL5AP. My amateur class is 1st Class Amateur (same as top class in W), and I am QRV on all bands/modes with 2 meter, and a keen award hunter and DXer.

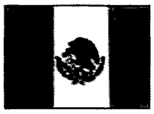
I am chairman for the Korea DXer Society, established in 1960 with HL9KKB, etc., and we issue the WAK award to hams and SWLs. I am at PO Box 4, Haeundae, Pusan, Korea 607-04.

I am QRV on 14 MHz CW every day around 2300–0200 UTC, and 0600–0800 UTC 14 MHz CW for DXing. I should like to QSO everyone, spread out all over the world. My QSL manager is Hideke Nishida JH4NPP, PO Box 229, Okayama, Japan 700. It is OK via JARL/JH4NPP or my QTH also.

My two sons are also hams: HL5QU and HL5BDE, who is the main engineer on the M/S *Spring Swift* under a Liberian bulk carrier [flag]. He hopes to operate EL0??/MM soon if he can get a license from the Liberian government.

I was chief radio operator for the *Sanke Line*, and once was a flight radio operator and communications manager for an airline, with 5,000 hours of flying time. I was a radio engineer in Saigon during the Vietnam war.

It didn't surprise us to hear from HL5AP—We hear more and more from hams all around the world. But we bet it will surprise HL5AP to see parts of his letter here! When space is available, we enjoy sharing our mail. Write us, and maybe you'll be surprised, too. Maybe we'll start a new small section—International Ham Of The Month—and select one letter from an overseas ham each month.



MEXICO

Mark Toutjian XE1MKT
Apartado Postal 42-048
06470 - Mexico, D.F.

GOOD NEWS FROM MEXICO

More than a year has gone by since the big Mexico City earthquake. Bad memories were brought back once again with the recent El Salvador earthquake, but Mexican hams were quick to respond to the needs of our friends "south of *our* border."

I cooperated with a local cultural group near my home which was able to send, from Mexico City, a 10-ton truck with supplies to friends in San Salvador. The customs officials at both borders (Mexico/Guatemala and Guatemala/El Salvador) were outstandingly organized and helped us through with no red tape. But how was it possible for us to find out the needs of our friends down south—since there was little or no telephone communication into El Salvador for some time?

A new ham flies high! XE1XJX with his wife and daughter. XE1MKT and his wife, XE1RBT, are behind.

You guessed it! If it wasn't for my ham equipment, we wouldn't have known that our friends needed more than a thousand sheets of galvanized roofing, literally tons of food, blankets, medicine, and other necessary items.

After the trucks had arrived, what a pleasure it was to hear Dominic, in San Salvador, all choked up on the air, trying to thank us for all that was done.

Yes, ham radio had done it again!

THE JOY OF HAM RADIO

At the time of this writing, I am in the middle of writing a new book, entitled *The Joy of Ham Radio—A Beginner's Guide*.

When I first began investigating ham radio, I felt that I was lost in a jungle full of tubes, circuits, wires, and strange people who crawled out of bed in the evening for QSOs, QSYs, and QRTs. I sympathize with today's innocent and bewildered beginner who is often on the border of pulling the plug and picking up another hobby.

My book is to *encourage* the real newcomer who has a spark of interest but has no idea of what he's getting into. Learning something new can be joyful. Ham radio is not the exception.

Besides the introduction, there are six basic chapters, two appendices (one with a glossary of ham-radio terminology and one with charts and tables), and a subject index for quick reference. Depending on the agreement between the publisher and me, I hope to have the Spanish edition available not too long after its first U.S. printing in English.

For me, trying to learn on my own was not easy at all. Trying to determine what equipment I should buy, how and where to install my antennas, and all the other juicy details, was like trying to nail jello to a barn door.

Special Note: Congratulations to my father-in-law, Jesus Becerril XE1XJX, who just got his license after many years of interest in ham radio! In fact, he was the one who first got me started!

YUGOSLAVIA

Djurica Maletin YU7DR
PO Box 132
21400 Bačka Palanka
Yugoslavia

I hope the information I will have for *73* International will be interesting because I work each day on all HF bands and participate a lot in HF contests. Also, I am a QRQ CW contester.

The **Vojvodina Award.** On HF bands 1.8 to 28 MHz (no new bands), six contacts from Europe with YU7 or 4N7, YT7, or YZ7; two contacts DX. On VHF band (144 MHz), three contacts from Europe, one DX.

Send GCR (no QSL cards) with 8 IRCs or U.S. $1 to Savez Radioamatera Vojvodine, Trg Lenjina 10, 21000 Novi Sad, Yugoslavia.

Information about licenses can be had via SRJ, Box 48, 1101 Belgrade, Yugoslavia.

All QSL cards for 4O7WCY, YT0ARG, YZ7Q, YZ7L, YZ7ARG, YT7T, YZ7DR are sure through YU7DR.■

PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40			20	15	15	15	15	
SOUTH AFRICA									15	15	15	
U.S.S.R.							20	20				
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20	20						15				
ARGENTINA										15	15	15
AUSTRALIA	15	20				40	20	20				15
CANAL ZONE	20	20	40	40	40	40			15	15	15	20
ENGLAND		40	40					20	20	20	20	
HAWAII	15	20	20	20	40	40	40					15
INDIA								20	20			
JAPAN								20	20			
MEXICO	20	20	40	40	40	40			15	15	15	20
PHILIPPINES								20	20			
PUERTO RICO	20	20	40	40	40	40			15	15	15	20
SOUTH AFRICA										15	15	20
U.S.S.R.								20	20			

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20	20	20		40	40	40	40				15
ARGENTINA	15	20		40	40	40					15	15
AUSTRALIA		15	20	20			40	40				
CANAL ZONE			20	20	20	20	20	20				15
ENGLAND									20	20		
HAWAII	15	20	20	40	40	40	40					15
INDIA		20	20									
JAPAN	20	20	20			40	40	40			20	20
MEXICO			20	20	20	20	20					15
PHILIPPINES	15						40		20			
PUERTO RICO			20	20	20	20	20	20				15
SOUTH AFRICA										15	15	
U.S.S.R.									20			
EAST COAST		80	80	40	40	40	40	20	20	20		

G = Good, F = Fair, P = Poor.

April will be an excellent month for HF DX. Due to seasonal improvements and increasing sunspot activity, the ionosphere will be capable of providing daylight-to-dark DX openings on 20, 15, and occasionally 10. The poorest propagation will be before the 10th of the month due to an active geomagnetic field. After the 10th, only occasional disturbances will disrupt east-west path propagation.

APRIL

SUN	MON	TUE	WED	THU	FRI	SAT
			1 F	2 F–P	3 P–F	4 F–P
5 P	6 P–F	7 F–G	8 G–F	9 F–P	10 F	11 G
12 G	13 G	14 G	15 G	16 G	17 G	18 G
19 G	20 G	21 G	22 G	23 G	24 G–F	25 F
26 F–G	27 G	28 G	29 G	30 G		

MAY 1987
Issue #320

73 Amateur Radio

A WGE Publication

USA $2.95
CAN $3.95

VHF/UHF

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NEVER SAY DIE

NOVICE ENHANCEMENT—WELL, IT WON'T HURT

The Novice Enhancement bands will, in my estimation, help to attract a few more Novices and should help considerably to improve the percentage of Novices who upgrade.

The Novice ticket was always a kick in the head—forcing newcomers to use our slowest and most difficult means of communications on our most crowded and difficult bands. One could hardly orchestrate a better system to defeat Novices if one tried.

But of course what will probably happen is the same as we had thirty years ago when Novices were permitted to use phone from 146–147 MHz—they'll rush to use the phone allocations, and that's all most of 'em will ever use. The two-meter Novice phone allocation was removed when it was found that a very high percentage of Novices used it exclusively and then, when their nonrenewable licenses ran out, were gone—forever.

Look, I've been pushing for a no-code license (with a more serious technical exam in its stead) for over thirty years now, but I've never suggested this was any kind of a cure-all for our dropping numbers. A no-code ticket, plus the new Novice bands, will help. I'll expect to see a small growth in our numbers, but as far as having even a slight effect on America's loss of high-tech career people... no way.

If we're going to get back to even the moderate growth amateur radio had from 1946–1963 (17 years) of 11% per year, we're going to have to get serious about rebuilding the infrastructure which brought us young newcomers—school radio clubs. Today, even after editorials and articles in both *73* and *QST* on the importance of getting youngsters into the hobby, many (perhaps most) ham clubs are still hostile to kids and go out of their way to discourage 'em. I'm not just blowing steam—I'm getting letters from young hams reporting their great frustration over the treatment they've gotten from their local ham clubs.

How is it at your club? When a Novice comes to a meeting, how many members go out of their way to welcome him to our hobby? How many invite him to visit their ham shack? How many offer to help him upgrade? How many even say hello? What I keep hearing is that the club members treat Novices like Untouchables in India. Yuccck, a Novice—what's *he* doing here?

Probably the brightest side of Novice Enhancement is that the ham industry will start seeing some additional equipment sales—which I don't begrudge them a bit.

By now you've heard that the FCC is well on its way toward taking almost half of our 220-MHz band away so more ordinary people can have mobile radios. After how many years of my warning you this was coming, it shouldn't be even a small surprise. And don't buy the guilt trip about your not using the band. The reason most of us haven't used 220 MHz is because we didn't need to and there weren't any big benefits to using it—so why should we spend several hundred hard-earned dollars to buy the gear? The hard fact of life is that with the small number of active hams we have left today, much of two meters is little used over most of the country.

Hey, it wasn't all that long ago that the top two MHz of two meters was virtually unused. Hams with longer memories will remember when the publisher of *CQ* proposed giving the two MHz up so it could be a new CB band and thus get away from the horrid skip plaguing eleven meters. We've solved that instead by getting rid of the sunspots—at least for a few years.

Last year there was Don Stoner's proposal to take the top two MHz of six meters and turn it into a Citizen's Packet Band. I think this was more defeated by

Continued on page 10

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

Editorial Offices
WGE Center
Peterborough NH 03458-1194
phone: 603-525-4201

Advertising Offices
WGE Center
Peterborough NH 03458-1194
phone: 800-225-5083

Circulation Offices
WGE Center
Peterborough NH 03458-1194
phone: 603-525-4201

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Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. A premium will be paid for accepted articles that have been submitted electronically (CompuServe ppn 70310,775 or MCI Mail "WGEPUB") or on disk as an IBM-compatible ASCII file. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

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QRX . . .

EDITED BY PERRY DONHAM KW1O

Golden Gigahertz Contest

ICOM AMERICA AND *73* are proud to announce that the first Golden Gigahertz Contest will be held from **0001 UTC July 13th through 2400 UTC July 14th**. The contest frequencies are 1.260–1.300 GHz. All participants will receive a T-shirt and a hat, courtesy of ICOM. A "Golden Gigahertz" mounted on a plaque will be presented to the winner. **Next month** in *73* we'll print the complete rules and there'll be a coupon for you to send in to receive your log sheets and your T-shirt/hat. In the meantime, get on 1.2 gigs.

Sour Sale

IN A SOUR GRAPES move that probably had Novices laughing their heads off, hams at the recent Wheaton (Illinois) Hamfest displayed their anger over Novice Enhancement by selling off their 220-MHz gear at giveaway prices, saying that they would never again operate on that band, or any other band where Novices were allowed to use a microphone. Of course, savvy Novices were stumbling over each other trying to get in line to buy the cheap equipment. For the most part, sentiment seems to be running in favor of the expanded privileges, although some diehard (i.e., narrow-minded) hams are dead set against the idea. These nonprogressives will be turning their collective backs on our most precious resource: the horde of bright-eyed, eager-to-learn amateurs that are the lifeblood our hobby so badly needs. We all should make a special effort to encourage the Novices we come in contact with to explore the new range of possibilities now available to them.

Range Wars II

IT'S AMAZING TO ME that this hobby can be deregulating with one hand and getting crazily more complicated with the other. One of the biggest complications is the problem of coordinated repeaters, which looms larger and larger each month. The fact of the situation is that there are just too many repeaters on the air: One estimate (I think it was Wayne's) projects that we are rapidly approaching the one-ham, one-repeater mark. (One fine result of this boom is that, while there are more machines to work through, the limited number of hams using repeaters is spread out over the increased number of repeaters. We end up calling fruitlessly on machine after machine in search of a QSO.) Folks are getting nasty about who has the "right" to occupy a certain frequency, so much so that the FCC had to step in recently and declare that non-coordinated repeaters found interfering with coordinated repeaters were at fault and had the burden of resolving the problem. This, of course, started another equally intense battle over who is a "*bona-fide*" frequency coordinator, with little repeater kingdoms sprouting up all over the place. The upshot of this story is that the ARRL will now publish in the *ARRL Repeater Directory* only those listings that have been submitted by a *bona-fide* Frequency Coordinator. If you have no idea whether or not your repeater (you do own one, don't you?) is coordinated or not, look in the *Directory* for the coordinator in your area and ask him; you can also get the list of "approved" coordinators by sending an SASE to the League at 225 Main Street, Newington CT 06111, Attention: Repeater Directory Editor.

Buy DXCC

IF YOU'RE A HAM who prides himself on owning the latest thing in amateur radio, the kind who immediately sells his transceiver when the new models are announced, then have we got a deal for you! For a mere **$10** million or so, you can own your very own DXCC country! That's right, you get an entire atoll (Palmyra) complete with its very own callsign (KH5). Of course, since you'll own the country, you can change the callsign to fit whatever mood you're in. **Jack Wheeler KH6CC**, speaking in the *W5YI Report*, advises, "The weather on Palmyra is terrible. . . it rains all of the time. The clothing will rot right off your back! It's not a desirable location for a permanent installation. That's why the Navy gave it up so readily after the war." If you are interested, contact Savio Realty in Honolulu.

King Unpinned

ROBERT KING WB8WKA has signed a consent agreement which ends a battle with the FCC that has lasted nearly two years. The trouble stemmed from a complaint that King allegedly maliciously interfered with the .04/.64 repeater in Detroit. After being indicted with the charges, King agreed to a 14-day suspension of his commercial radiotelephone license, while denying the charges of interference. The commission then revoked his amateur license based on King's agreement to the 14-day suspension. The revocation was overturned by an FCC Administrative Law Judge who found that "the bureau carefully concealed from Mr. King and his counsel its intention to use Mr. King's consent to the suspension of his commercial radio license as a basis for seeking revocation of his amateur radio license." The consent agreement means that the FCC has terminated revocation and suspension proceedings against King; the agreement is not an admission of guilt

Jammer Jammed

LARRY KACZMARCZYK, ex **W3UQW**, of Manhonoy City, Pennsylvania, was recently fined $1,000 for malicious jamming which was monitored *and* visually observed by engineers from the Langhorne FCC office. Kaczmarczyk had surrendered his license for cancellation some time ago as a result of an FCC case against him involving alleged malicious interference.

No 17 Now

THE FCC HAS DISMISSED a petition filed by the ARRL which sought earlier access to the new 17-meter band (18.068–18.168 MHz). Over 60 countries now allow amateur operation in the segment, but the current primary users (government agencies) say that they will need the band until July 1, 1989.

5L Fete

1987 IS THE 25TH anniversary of the Liberia Radio Amateur Association (LRAA), and the group has planned several events to commemorate the occasion. Throughout 1987, Liberian hams will use a 5L prefix in place of the normal EL (EL2XT becomes 5L2XT, etc.). During special 25th-anniversary events, the suffix /25 will be tacked on. The Liberian Ministry of Post and Telecommunications is issuing a special postage stamp in honor of the event. Other activities include an International QRP Day, a special DX contest on Liberian Independence Day (July 26), and an emphasis on the Work All Liberia award. To qualify for the award, work one station in each of the nine Liberian counties (the number in the call denotes the county) on at least three bands. Send QSLs confirming your contacts and U.S. $5 to LRAA, PO Box 987, Monrovia, Liberia.

Dateline Dayton

THE DAYTON AMATEUR RADIO ASSOCIATION (DARA) is once again offering their popular college scholarship program. Any licensed amateur graduating from high school in 1987 is eligible to apply for one of the $1,000 awards. The scholarships are granted based on a combination of financial need and academic accomplishment, with consideration given to service to amateur radio and community involvement. Applicants are not restricted to those pursuing a baccalaureate degree; those working toward associate or trade/vocational degrees are also encouraged to apply. **All entries must be postmarked no later than May 15, 1987.** Winners will be announced around June 1, 1987. For more infor-

mation and an application form, write to the DARA Scholarship Committee, 317 Ernst Avenue, Dayton OH 45405.

More Money

THE FOUNDATION FOR AMATEUR RADIO (FAR) has announced that twenty-six scholarships will be awarded for the 1987–88 academic year. Any licensed amateur pursuing full-time studies at an accredited college, university, or technical school is eligible to compete for these awards. Most of the scholarships require at least a General-class license. The awards range from $350 to $900, with preference given in some cases to specific geographical areas. Information and application forms are available from FAR Scholarships, 6903 Rhode Island Avenue, College Park MD 20740.

Bed Pan Portable

MEMBERS OF THE RADIO AMATEURS OF EASTERN LONG ISLAND were recently asked to provide backup communications for Long Island's Southampton Hospital while the facility's telephone system was being expanded. Organizers Bill Yamka N2DXG and Charlie Styler WA2UEG were joined by Richie Sellentin N2RL, Susie Yamke N2GYR, Mary Sellentin N2GTK, Rune Pehrson W2VMI, Rod Swiderski NU2M, and Serge Popper N2DEJ; the group was spread out to strategic locations throughout the hospital and communicated via two meters.

F8E OK

HAMS MAY NOW USE F8E on 902 MHz and above. F8E, in which the carrier is modulated by two or more voice channels (stereo), was previously restricted to only the 900-MHz band. The action is in response to a petition submitted by the Southern California Repeater and Remote Base Association.

Israeli Shift

NEW ISRAELI PREFIXES will be showing up on the bands very soon, according to a story in *The Westlink Report*. Israel's calls have been restructured, with the callsign now reflecting the operator's license class. Novices will hold calls from the 4Z9AAA–4Z9ZZZ block; class B ops will retain their 4X4, 4Z4, and 4X6 calls; class A (up to 1,500 Watts out) amateurs will sport new 4X1 prefixes.

Exit, SL

THIS MONTH'S NEWS came to you with help from *The W5YI Report*, *Westlink*, and *The ARRL Letter*. Please send your news notes and photos to *73* Magazine, WGE Center, Peterborough NH 03458, Attention: QRX.

NEVER SAY DIE

from page 4

worries over interference to TV than any concern over the loss to amateur radio. The scuttling of the FCC's try at a no-code ticket for us left us with few friends where they really count, so we'd better get used to giving up our bands—particularly in the microwaves.

The only way I can see a major change coming about would be if we stopped our infighting and our pretending that our days of fun and games will never end. It is time to get serious about getting our hobby growing again. And I mean growing at 30–50% a year, not 5%.

Westlink reported that some hams, upon learning that Novices would soon be sharing 220 MHz with them, sold their rigs in disgust. Frankly, I think they did exactly right. The last thing we need on 220 MHz to greet the Novices are a bunch of narrow-minded bigoted rednecks like that. No, what we do need up there is a big welcoming committee, complete with repeaters. More than that, let's start setting up 220 repeaters which crossband to 20m and 75m, so they can discover the fun we've been having.

How many crossband contacts have you ever made? I've had a ball with 'em down through the years. Back in 1950, I used to interconnect 2m and 80m RTTY stations. Back in the early repeater days, the Concord (NH) repeater would switch over to 6m for a few minutes every hour. If you started using it during that time, it would stay in that mode until you quit, so I had lots of great 2/6m contacts.

Along in 1971, my WR1AAB repeater was set up so it could work 2/6m or 2/10m. I had a ball talking with South American stations through my repeater. I set up another for 2/20m and was able to walk almost anywhere in town and work 20m with my hand-held 2m rig.

Back in 1946, I had a ball interconnecting 20m and 75m sta tions, making it possible for those on a 75m net to work some darned good DX. That was quite legal and, by the way—still is. It was a ball getting a ZS or a 5N into a 75 round table. I'll never forget it.

"The last thing we need on 220 MHz to greet the Novices are a bunch of narrow-minded bigoted rednecks. What we do need up there is a big welcoming committee, complete with repeaters."

We can do the same for Novices if we set up our repeaters so they can provide a window on our lower bands. The FCC has gotten used to this and agrees it's legal.

It's a shame that we're about to lose a big chunk of 220, now that we may have the first real use for the band. The problem, as I mentioned earlier, is that we have far too few amateurs to actually use the frequencies we've been allotted. We tend to take the easy path, jamming ourselves up on the low bands and avoiding the extra expense and trouble of developing the UHFs.

When repeaters got going on 2m, most 6m operation soon ceased. Much of 6m is deserted now. Oh, if the sunspots bring some skip back to 6m, we'll see some action, but since there are very few countries where amateur operation is permitted on this band, it won't be big.

Two meters is fairly well occupied, between sideband and repeaters. 220 is sparsely used—a few repeaters, but most of them not very active. Heck, for that matter, I'd estimate that about 75% of the 2m repeaters are rarely used. These are more monuments to egos than real services to their communities.

On 450, there are a few repeaters and a lot of control links—most of 'em in the major urban centers. Above that is almost nothing, being practical about it.

I believe we'd have to double the number of active hams before we'd see much action above 450 MHz—or even a reusing of 6m. Hey, back when 2-1/2m and 10m were all we had, back in early 1946, 10m was a lot more active than it is today—even at night.

So don't let anyone build up a guilt trip for you because you haven't spent time and money to get on 220 MHz—or 1296 MHz, etc. It isn't your fault—or mine—that we don't have enough hams to even begin to use the bands allocated to us. How long did you think the manufacturers were going to let all those incredibly valuable and virtually unused frequencies sit there gathering dust?

It was back around 1971 when a CB manufacturer bragged to me that 220 MHz would shortly be a new CB band. He claimed the EIA had "bought" the chairman of the FCC. It did look as if we were going to lose it, but we got a new FCC chairman and that eased the pressure.

Just where lobbying and "buying" leave off, I don't know. I do know this manufacturer was willing to cover any bet I cared to make—they'd already brought out a 220-MHz rig for the new service. He said that he and another manufacturer were in cahoots on the project and it was an accomplished fact. His partner was very arrogant about it at the time—wonder how he's doing today. The CB crash demolished them—which seemed like poetic justice, since they were prime movers in the 50-channel CB move, as I recall. And that's what killed CB—or at least badly wounded it.

What can you do? Not much about the 220 loss, but you can start working toward getting amateur radio growing again. You can welcome Novices to what's left of 220. You can set up crossband repeaters for them. You can work toward getting school radio clubs going again so we'll have more youngsters coming into our hobby. Or you can shrug your shoulders and carry on, bitching, but doing nothing.

If you disagree, what do you think. . . and why do you think it? Any facts?

> ***"Who knows, you might grab me at breakfast one morning and get me to come up with some new ideas for your business."***

PICK SIX REASONS TO GO TO ASIA WITH WAYNE THIS FALL

1) It's fun. You'll get to see (and take pictures) in Japan, Taiwan, Korea, and Hong Kong—all those fantastic places you read about and see in the movies. You don't want to miss the Korean Folk Village—or the Double-Ten extravaganza and fireworks in Taipei, which you'll never forget (October 10th)—we'll have good seats for the spectacle.

2) The food is fantastic. You get a first-class American breakfast every morning as part of the tour package—plus a major dinner party in each city. For the cautious there are Wendy's nearby in all cities. I'll take tempura.

3) First-class hotels all the way.

4) You'll see the latest in electronics at the consumer electronic shows—and be able to meet businessmen to make deals. Just one small product could pay for your trip a hundred times over. There are seminars to help you do business. You'll never find a better way to meet Asian businessmen.

5) Ahhh, the shopping! Few return without a custom-made suit or two. Do you want your new custom raincoat to be Burburry or London Fog design? What monogram do you want on your $10 custom-made shirts? Better bring an extra bag—I always do. $3 Gore-Tex skiing gloves and Member's Only jackets for $5 at Itewon in Seoul. Bargain furs. CDs from all over the world—oodles of

Continued on page 42

LETTERS

WHY WE MUST FIGHT TO SAVE 220

While many of you might find it hard to believe, fighting to save the 220–222-MHz portion of 1-1/4 meters is more than keeping 2 MHz of spectrum for our service. What we have here is really an all or nothing situation. Here's why.

For more years than I can remember, I have been trying to get it into the sometimes thick skulls of American radio amateurs that every kilohertz of spectrum that we have is worth millions of dollars to companies who can use it to provide other services.

For instance, let's take the 420–450-MHz amateur band. 30 prime MHz of spectrum right where the vast majority of UHF land-mobile radios now operate. Think if you will for a moment in terms of simple economics. The basic top-line land-mobile radio sells for about $3,500 these days. My friends tell me that it's about the same for a base. An average business will probably have at least a half-dozen mobiles and one or two base radios. Then there's installation of antennas and other peripheral gear.

Next comes the standard shared community repeater, which can cost another several grand. It has to have an antenna and a duplexer, and it pays a site rental fee. Some sites are charging systems $300–$600 a month or more. There's also the monthly fee to use the radio relay system, and in many places that's based on whatever the traffic will bear.

Multiply that out by the number of repeaters and users that can be crammed into 30 additional MHz of space, and you are talking annual profits into the megabuck range. So, if you are a businessman involved in two-way land-mobile, wouldn't you be looking at your neighbor with a jaundiced eye? Nor is land-mobile the only user up there.

I'm a broadcaster by profession, and we use frequencies in and around the 460-MHz region for remote pick-up. And, there are hundreds if not thousands of other potential users out there as well. So, what is 420 to 450 MHz worth to anyone who can wrestle it away from hams? You may find this hard to believe, but over a 10-year span at maximum utilization, the figures would be into the hundreds of millions of dollars. And, many of us freely admit that in many parts of the nation, 420–450 MHz is an underutilized band!

I can hear you saying: "Well, at least two meters is safe. Heck, there must be a half-million hams on those 10,000 repeaters." I can only remind you that even if every licensed ham were active on 2-meter FM—and they're not—it would be nothing compared to the amount of people that land-mobile (or any other service eyeing our bands) might squeeze into that same 4 MHz at several grand a pop.

What I've said about 420–450 applies to the 2-meter band and any other—including the HF bands. As this is being written, word is quietly filtering out from an HF WARC that many Third World nations want hams kicked off some prime high frequency bands to make way for more international shortwave. If I may quote from the January 15 issue of the *W5YI Report*:

". . . many countries have submitted more requirements than can be handled in the presently allocated frequency bands. At this point it looks impossible that these needs can be filled by the ITU. There has been some formal discussion about developing and adopting a resolution at this conference that would call for a future conference to completely reallocate the high frequency bands. . . . A highly placed government official (who asked that he not be named) recently told me that the HF broadcasters would be looking for more spectrum since they do not have enough now and 'The amateur bands would be extremely vulnerable at a future allocations conference.' "

Most high-frequency ham bands are likely to come under attack because they directly adjoin spectrum used by HF broadcasters. The two primary targets are likely to be 40 and 20 meters! The new 10-MHz band might be targeted as well. And here it's not just gigabucks at stake, it's nationalistic pride as well.

So why fight to save two lousy MHz of a band that you yourself don't use and may never use? Simple. If we lose 220–222 MHz, it will prove that we are vulnerable—that we cannot wage a successful campaign to protect our spectrum. Once "they" know this, no amateur band from dc to light will be safe from the money-mongering spectrum thieves. The "they" are all other services, service users, and allied businesses that would profit immeasurably from the demise of amateur radio.

If we ever let this "Pandora's Box" be opened, it won't be a "hunt and peck" for a few kHz here and a few kHz there. The enemy will make one swift frontal attack, and it will be all over. In a flash, amateur radio will cease to exist! Think I'm crazy? Blowing straws in the wind? For your sake, I hope so. But, as even Wayne will tell you, in the 25 years I've been writing for *73*, I have been correct far more times than I have been wrong. I did call it wrong on no-code, but nobody's perfect.

Some of you reading the proposal might be tempted to support 87-14 because it holds the promise of three secure MHz of spectrum if we give up two MHz under the current insecure allocation plan. I say "nuts" to this proposition. What we want, what we demand, the only thing that we hams will settle for is 220–225 MHz being made amateur-exclusive, and all others be damned!

Although the deadline for comments will have passed by the time you read this (unless an extension is obtained), there is still one thing that you can do. If you have a couple of extra QSL cards handy, take a few of them and send them to your congressmen. Where you would normally put a signal report, write instead "The FCC's Office of Engineering and Technology is trying to steal our ham bands with Docket 87-14. Right now they want our 220 band. HELL NO—I WON'T GO!"

Former California Congressman James Corman said back in 1979 that nothing gets the attention of a legislator like a QSL card. We know for a fact that this method is effective in dealing with jammers and foulmouths. I wonder what impact several hundred thousand QSL cards reaching Congress might have on the future existence of the Office of Engineering and Technology? Remember, turn-about is fair play.

Bill Pasternak WA6ITF
***73* Staff**

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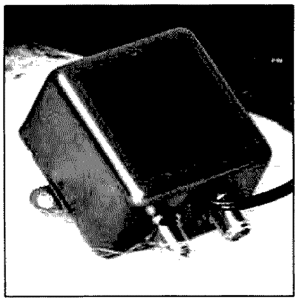
Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0745-080X) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

NEW PRODUCTS



EPI's model RFA-16B VHF/UHF rf amplifier.

EPI RF AMPS

Electron Processing, Inc., has introduced a line of Signal Intensifier™ rf amplifier modules suitable for almost all receiving applications. Available in either MF/HF or VHF/UHF versions, they feature 13 dB gain with very low noise figure (typically under 5 dB). Model RFA-20 (MF/HF) comes with a pair of SO-239 female coaxial connectors. Model RFA-16B is equipped with your choice of "F" connectors or "Motorola" connectors. Other connector styles are available upon request. Both feature a built-in 117-V-ac power supply. Prices start at $29.95.

For more information on EPI products, circle number 205 on your Reader Service card.

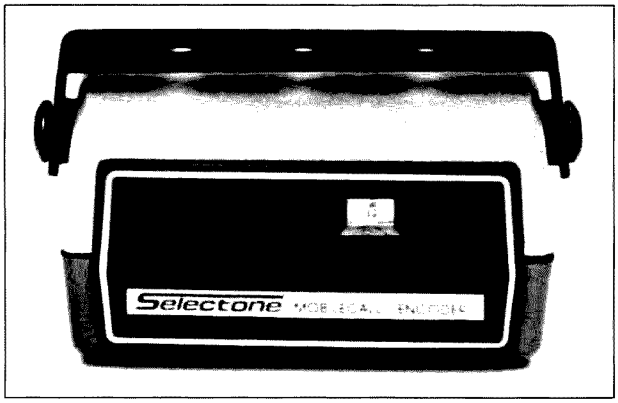
DASH-MOUNTED CTCSS ENCODERS

Selectone Corporation has announced a new line of CTCSS dash-mounted Mobilecall® encoders that are used for selecting one of several repeaters operating on the same frequency. Up to ten different frequencies can be selected with a backlit pushwheel switch on the front panel. Tones are digitally programmable to any of the 38 CTCSS frequencies.

The units operate on 13.6 V dc (±20%) at less than 25 mA. Tone output level is adjustable to 1.5 V rms. The user has a choice of a 6-dB-per-octave roll-off or flat audio output. Built-in light sensors automatically illuminate the switch at night.

These Mobilecall encoders are available in two configurations: The ST-109A ($99) is the standard unit, and the ST-109B ($129) adds a phase-shift circuit for squelch tail elimination (STE) which is compatible with most Motorola and GE CTCSS systems, including reed-type decoders. The units come complete with mounting bracket and cable assembly.

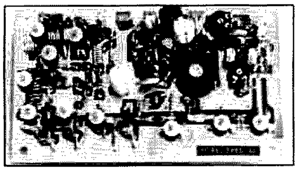
For more information on these Selectone encoders, circle number 213 on your Reader Service card.



Selectone's Mobilecall CTCSS encoder.

33-CM ATV EXCITER/MODULATOR

P.C. Electronics has introduced its model TXA5-33 1-Watt ATV exciter/modulator board for the 33-cm band. Most activity has been on the 70-cm band until now. By also having a 33-cm ATV station, hams can run full-duplex video and audio crossband with another station on 70 cm. This board should make it easy to put up a short-distance video link, crossband ATV repeater, bulletin board video repeater, or public-service/weather-radar video service—



The TXA5-33 exciter/modulator board for the 33-cm ATV band.

without tying up one or both of the usual 70-cm ATV channels. The TXA5-33 sells for $139.

For more information about the TXA5-33 and other P.C. Electronics products, circle number 209 on your Reader Service card.

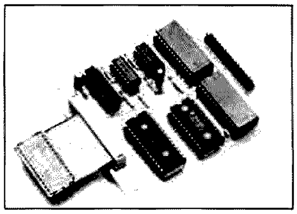
PC WEATHER

Technology Marketing, Inc., has introduced a sophisticated weather monitoring and analysis system called PC Weather. PC Weather comes complete with its own anemometer/wind-vane assembly, two temperature probes, a half-slot PC board, and display software. This system allows you to monitor and display local weather conditions on an IBM PC/XT/AT or compatible. Features include wind speed, wind direction, barometric pressure, inside and outside temperatures, and wind-chill factor.

The PC Weather display is background resident and may be accessed at any time, even from within a spreadsheet or word processor. An on-board alarm will be sounded when certain programmable weather conditions are met. PC Weather is externally powered by an ac adapter and continues to monitor weather conditions and alarms even when the host computer is turned off.

The PC Weather package is priced at $349.95. Options include a rain gauge and PC Weather Pro, an enhanced software package that provides expanded display data and analysis capabilities. Each of these options is priced at $69.95.

If you really want to let someone have it when they ask how the



Communications Specialists' TP-TOS tone output switch module.

weather is, circle number 211 on your Reader Service card.

CSI TONE OUTPUT SWITCH MODULE

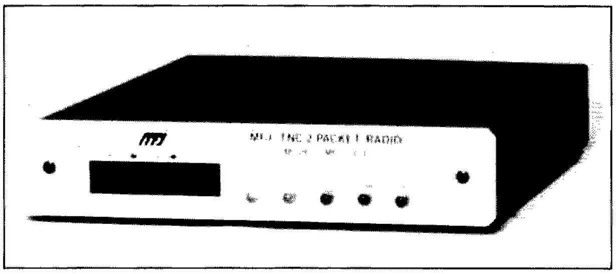
Communications Specialists, Inc., is now offering the TP-TOS tone output switch module as an add-on accessory for their TP-38 shared repeater tone panel. The TP-TOS provides individual discrete switch outputs for the standard 32 tone frequencies from 67.0 to 203.5 Hz. The 32 outputs can be configured to provide either a pull to logic ground, a pull to logic high, or to route an audio signal to another transmitter, receiver, tape recorder, etc. The TP-TOS is priced at $99.95.

For more information about the Communications Specialists TP-TOS, circle number 212 on your Reader Service card.

MFJ-1274 HF/VHF PACKET TNC

MFJ Enterprises, Inc., has released its latest TAPR TNC-2 clone, the MFJ-1274. The 1274 works on VHF, HF, OSCAR, and other non-FM packet. MFJ has made the TAPR modem selectable for VHF and HF operation and has added: a 20-segment LED tuning indicator, a TTL serial port, a lithium-battery memory backup, and a new cabinet. The 1274 interfaces with any computer with an RS-232 serial port and appropriate terminal program.

The 1274 features AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true data



The MFJ-1274 HF/VHF packet TNC.

carrier detect for HF, multiple connects, and 256K EPROM/16K RAM. Speeds in excess of 56K baud are possible with a suitable external modem. The 1274 sells for $169.95.

For more information about the MFJ-1274 TNC, circle number 208 on your Reader Service card.

WORLD HAM NET DIRECTORY

The World Ham Net Directory by Mike Witowski has been published by Tiare Publications. It lists 300 special-interest ham radio networks by name, operating frequency, and day/time. The nets cover a wide range of interests including emergency communications, DXing, missionary work, foreign service, retirees, airline employees, weather watchers, traffic handling, and more. This book provides amateurs with the chance for new contacts and SWLs with more opportunities for interesting listening. *The World Ham Net Directory* is priced at $9.95 plus $1 shipping and handling.

For more information about *The World Ham Net Directory*, circle number 214 on your Reader Service card.

KANTRONICS KPC-4 DUAL-PORT COMMUNICATOR

The KPC-4 Dual-Port Communicator is Kantronics' newest packet unit. It features two fully functional VHF packet ports, digipeating on each port, VHF gateway between ports, and an RS-232 computer port. Digipeating and gateway operations occur simultaneously while you're connected on one or both ports. The RS-232/TTL terminal interfacing provides compatibility to all computers. Stream switching provides for access to both radio ports, each of which supports AX.25 protocol.

The KPC-4 also contains the Personal Packet Mailbox™ feature, which allows you to leave and retrieve messages. The KPC-4 is priced at $329.

For more information about the KPC-4, circle number 204 on your Reader Service card.

HAMTRONICS WXSAT CONVERTER

Hamtronics™, Inc., has introduced the CA137-28 receiver converter for reception of weatherfax pictures from satellites transmitting in the 137-MHz band. The CA137-28 translates all signals received in the 136–138-MHz satellite band for reception on tunable 28–30-MHz wideband FM receivers. To make the conversion in dial frequency, subtract 108.000 from the frequency you want to receive. The receiver uses a low-noise front end to provide sensitivity of less than 0.2 uV. It operates on 13.6 V dc at 30 mA. The CA137-28 is available for: $69 wired and tested in a cabinet; $49 in kit form; and $39 for a kit to build just the PC module. Shipping and handling is extra.

For more information about the CA137-28 converter, circle number 210 on your Reader Service card.

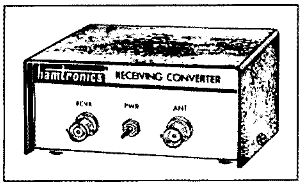
SEBHC JOURNAL

The *Society of Eight-Bit Heath Computerists Journal* is a monthly newsletter dedicated to serving the owners of Heath/Zenith H-8 and H/Z-89/90 computers. Its objective is to keep these computers alive, well, and productive, and to prevent the average H/Z eight-bit machine user from foundering in the sea of "Big Blue" clones. A one-year subscription is $15.

For more information about the *SEBHC Journal*, please circle number 217 on your Reader Service card.

TOKYO HY-POWER LABS 160-W 2-METER AMP

Tokyo Hy-Power Labs, a subsidiary of Encomm, Inc., has released their model HL-160V25A



Hamtronics' CA137-28 weather satellite converter.

2-meter amplifier. This amplifer provides 160 Watts of output from 25 Watts of input across the entire 2-meter band. The HL-160V25A amp can be used for FM, SSB, and CW operation and includes an internal GaAsFET preamp. The HL-160V25A is priced at $269.95.

For more information about Tokyo Hy-Power Labs amplifiers, circle number 215 on your Reader Service card.

DSE FIELD STRENGTH METER KIT

Dick Smith Electronics, Inc., has announced a new field strength meter kit. The field strength meter is built on a small PCB that mounts directly on the meter terminals. Only the sensitivity pot and power switch are off-board. The telescopic antenna mounts via a small right-angle bracket which bolts to the board. The case provides additional support for the antenna via a grommeted hole in the case top. The DSE field strength meter is priced at $39.95 plus $3.50 shipping and handling.

For more information about this and other DSE products, circle number 216 on your Reader Service card.

LARSEN AD-2/70 ANTENNA DUPLEXER

The new AD-2/70 dual-band antenna coupler has been released by Larsen Electronics, Inc. The AD-2/70 allows operation of separate 2m and 70-cm radios con-

Larsen's model AD-2/70 antenna duplexer for 2m/70-cm.

nected to a common dual-band antenna; it also allows separate 2m and 70-cm antennas to be used with a single-port, dual-band radio.

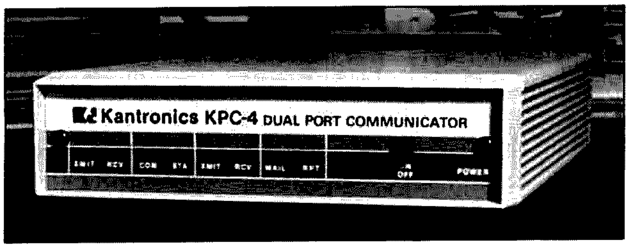
Gross band isolation is suppressed to −50 dB or more, permitting interference-free simultaneous transmission or reception. Maximum power rating is 200 W PEP composite VHF/UHF power.

For more information about the Larsen AD-2/70, circle number 207 on your Reader Service card.

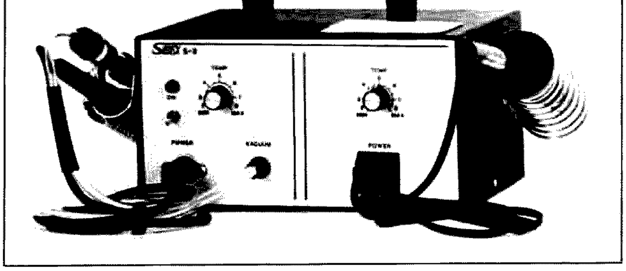
SOLDERING/DESOLDERING STATION BY SIBEX

Sibex, Inc., has released its model S-2 soldering/desoldering station. The S-2 allows any standard soldering iron to be temperature-controlled through the use of a separate dc voltage converter. The desoldering tool is temperature controlled in the range of 450–700° F. A vacuum pump is incorporated into the unit for efficient desoldering; the pump switch is built into the desoldering handpiece. The S-2 has holders for soldering and desoldering tools and has a built-in tip-cleaning pad. The price of the unit is $289.95.

For more information about the Sibex S-2, circle number 206 on your Reader Service card.



The Kantronics KPC-4 Dual-Port Communicator.



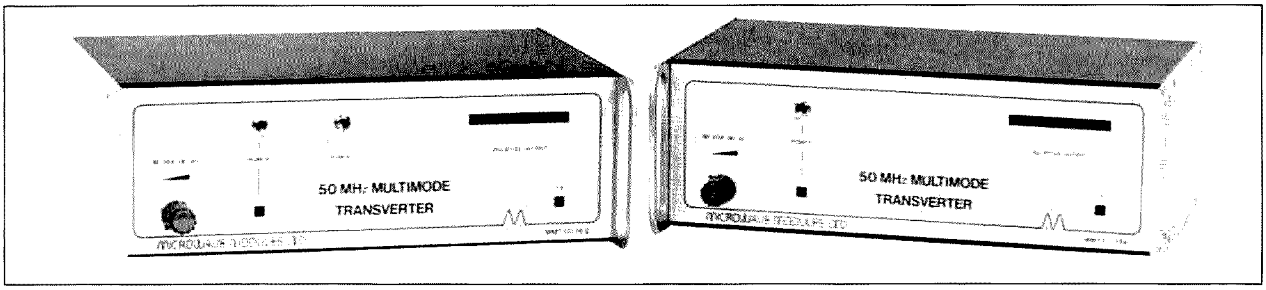
The Sibex S-2 temperature-controlled soldering/desoldering station.

73 Review

Microwave Modules MMT 50/144 and MMT 50/28S 50-MHz Linear Transverters

by Peter H. Putman KT2B

Imported by: The PX Shack 52 Stonewyck Drive Belle Mead NJ 08502 Price class: $350



It's been a long time coming, but Microwave Modules Ltd. of Liverpool, England, has finally brought out the six-meter counterpart to the two-meter MMT 144/28R (reviewed in the March, 1986, issue). Back then I was impressed enough with the MMT 144/28 that I (and many other VHF operators) started badgering Ivars Lauzums of The PX Shack (the U.S. importer) to "get a version of this on six meters!"

Things do move at a different pace in England, however. The factory was in the midst of developmental work on a six-meter transverter when the big news came out: British amateurs would obtain limited 50-MHz privileges with a power restriction of about 20 Watts and 7-dB-gain antennas. I'm sure this lit a fire under the designers at Microwave Modules, as word soon came from Ivars: "No problem. The six-meter units will be in by Dayton!"

Well, Dayton '86 came and went. So did the rest of the summer and the entire Es season, and still no sign of the alleged boxes. About November, however, I received word that some prototype units were on their way to the U.S. Upon arriving, though, they turned out to be 50/144 types, with a two-meter i-f instead of the more conventional 28-MHz i-f.

Why was this? It seems that the folks in Liverpool suspected that the class B licensees (VHF only) would be the ones to get the new 50-MHz privilege, and since it stood to reason that most of those operators had either existing multimode transceivers or transverters for the two-meter band, a 50-MHz to 144-MHz conversion made sense.

However—initially only the class A licensees obtained the 50-MHz allocation, and they preferred the standard ten-meter i-f scheme. (Class B licensees wouldn't come on board for a few more months.) So much for trying to predict the market. It was back to the drawing board in Liverpool!

To make a long story short, my initial exposure to this new product was with the MMT 50/144, and it works surprisingly well—so much so that, if you prefer the 50-to-144 conversion scheme, you won't give up much to your counterparts on ten meters. I'll touch on the technical aspects later on, but right now I'll take a brief look at the 50/144.

The MMT 50/144

The layout is similar to the MMT 144/28R, with a low-profile extruded aluminum housing that forms part of the power amplifier (PA) compartment heat sink and affords excellent shielding. The main power switch is located on the front panel, along with the VOX dropout delay adjustment. A series of LED indicators make up a bar-graph display to show relative output power, with full indication meaning that the transverter is running at about 20 Watts. Since i-f coverage is from 144–148 MHz, no bandswitching is required for full six-meter ranging.

On the rear of the MMT 50/144 are three coaxial connections and one power/keying connection using the standard MM 5-pin plug. The connection at 144 MHz is full transceive, with all T-R switching done internally. A resistive pad is incorporated into the design to allow direct drive with two-meter radios of up to 15 Watts output (great news for all you folks who always forgot the 15-dB attenuators and blew out the old 50/144 units). Provision is made through the rear panel to adjust the input drive level for full output. This adjustment will accommodate transceivers from 150 milliwatts to 15 Watts.

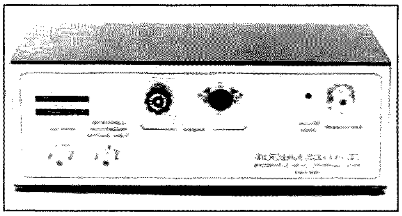


Photo A. Rear panel of the MMT 50/144.

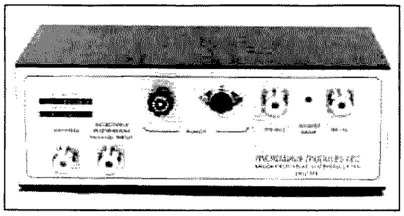


Photo B. Rear panel of the MMT 50/28S.

Provisions have been made for two different antenna connections at 50 MHz, largely due to some of the aforementioned "badgering" of the U.S. importer and the factory representatives at Dayton. It would appear that most hams in the UK prefer the full-transceive scheme on VHF frequencies, since most of them run solid-state power amplifiers after their transverters.

On this side of the pond, however, we have our share of high-power ops using all sorts of complicated relay-switching schemes. The answer on the MMT 144/28R was simply to punch another hole in the housing and add a dummy SO-239 connector to be wired as an option by the end user.

The solution on the MMT 50/144 is a bit more elegant, with a built-in slide switch selecting either the normal transceive route or the independent 50-MHz antenna input. This switch is accessible by removing the right side cover with the unit facing you. Now you can run mast-mounted preamps with two feedlines, or an outboard tube amplifier with a conventional SPDT relay and keep it simple. The separate receive input lends itself to an outboard preamp, which, as the test data shows, might be useful in certain instances.

Take a look at the main i-f board. The workmanship here is first-class, with a double-sided plated G10 epoxy board used. You'll notice right away the preponderance of toroids, and this is no accident. The designers of the MMT 50/144 wanted to obtain fairly broadbanded performance in both the receive and transmit sections, eliminating the need for critical alignment or fine-tuning.

With the proximity of television stations on channel 1 along the coast of Belgium and

The Netherlands, there was concern about possible interference to these services by the new UK 50-MHz allocation. Other concerns were voiced about interference to channels 2 and 3 as well, not to mention the FM broadcast band.

Microwave Modules has addressed this problem by providing extensive filtering in both the RX and TX lines. For example, an incoming 144-MHz TX signal is downconverted to 50 MHz and immediately passes through a low-pass filter after the dual-balanced mixer. After passing the buffer amplifier, it is routed through a bandpass filter which has reasonably tight skirts.

Next, a 2N4427 is used as a pre-driver stage and is followed by yet another low-pass filter. Finally, the signal passes through driver stage MRF237 and the final amplifier, a pair of 2N6082 devices, before it sees one last low-pass filter at the antenna jack. That's a lot of filtering! When was the last time you saw a six-meter rf amplifier chain with that lineup?

Incidentally, the 2N6082s are run well below their ratings, as a single device has a case dissipation rating of 65 Watts and delivers 25 Watts output at 150 MHz! The two employed here are set to run no more than 20 Watts output—don't worry about overheating.

The RX line looks pretty much the same. Incoming signals at 50 MHz are routed through a high-pass filter and into a pair of J310 JFETs operating in parallel. Next in line is a 50-MHz bandpass filter (the same one used in the low-level TX line) and another pair of J310 JFETs, this time working as a dual-balanced RX mixer. You guessed it—another bandpass filter follows (this one operating at 144 MHz), and the signal is then amplified by a 2N5109 to provide a sufficient output at two meters and overcome the 6-dB transmit pad.

I should pause and note here what some readers might already be suspecting: The front-end performance of the MMT 50/144 is not "hot" in the same sense that the MMT 144/28R is with its GaAsFET and diode mixer. What qualifies the MMT 50/144 and the MMT 50/28S in the "high-performance" category is the resultant dynamic range available from running low-level RX amplifier and mixer stages. However, the sensitivity of the unit is on par with most other 50-MHz equipment currently on the market.

It's pretty difficult to overload those J310s, and even harder to blow them to kingdom come in high rf fields. Contrast that with your garden variety GaAsFET, which rolls over and dies when lightning strikes 50 miles away or when your dog rubs its back on the carpet in the next room.

The MMT 50/28S

Now let's take a look at the MMT 50/28S, which followed its brother over the ocean by about two months. It is very similar in appearance to the 50/144. The big difference is the bandswitch, which allows coverage of either the 50–52-MHz or 52–54-MHz segment. This eliminates the need to make any modifications to your ten-meter equipment to obtain full coverage and is an option that was not available on the original 50/28.

Specification	MMT 50/144	MMT 50/28S
Minimum Discernible Signal, 1-kHz bandwidth	−124 dBm	−124 dBm
Signal for 10-dB S/N	.75 uV	.8 uV
Conversion Gain (dB)	10	18
1-dB Compression, output (dB)	+10	+15
Dynamic Range (dB)	124	121
Measured Power Output saturated @ 50 Ohms	19 W	20 W
Minimum Drive for full output	500 mW	.5 mW
Dc Current Draw	4 A @ 13.8 V dc	4 A @ 13.8 V dc

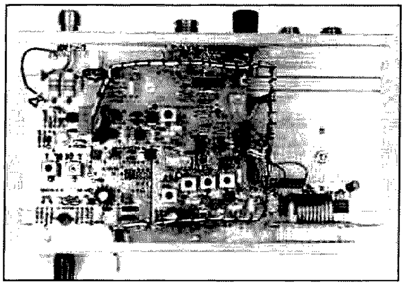


Photo C. MMT 50/144 i-f board. Note the 15-W resistive pad near the upper left corner.

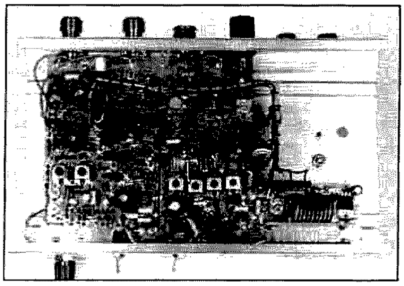


Photo D. MMT 50/28S i-f board. Note the switched low-level amplifier stage in the upper left corner.

The rear-panel layout is just like the 50/144 with the exception of separate 28-MHz TX and RX connections. You cannot use transceive connections on ten meters unless you employ an external relay at this point.

The lineup on the 50/28S is also similar, with the exception of lower drive levels at the input port. To accommodate a wide range of users, the factory has provided an on-board amplifier to boost very-low signals (5 mW or less) up to an acceptable level for the TX mixer section. If you have only this drive available, you'll need to engage the switch at the rear left-hand corner of the transverter (as viewed from the front).

The switch is easily seen on the main i-f board. The units come configured for a drive level of 300 mW, which is adjustable using the rear-panel potentiometer, as on the 50/144. The owner's manual gives a detailed description of how to set up the transverter to match your i-f requirements.

The TX and RX lineup is as described on the 50/144, with the exception of the booster amplifier in the low-level TX line. Incidentally, 2N5109 devices are used here and the circuit is broadbanded as well. J310s are used in the RX amplifier and RX mixer stages, and all of the bandpass, low-pass, and high-pass filters from the 50/144 are incorporated as well. An MRF237 is the driver, and a pair of 2N6082s produce 20 Watts while loafing along.

Both the 50/144 and 50/28S incorporate an ALC circuit, the level of which is not as adjustable as on the 144/28R. 20 Watts is what you see and 20 Watts is what you get! I suspect this was done primarily to allow the factory to breathe easier in the more restrictive UK market.

Performance Ratings

Now it's time to find out just how well the units work. For these tests, I employed both H-P 608F and H-P 8662 rf signal generators, a Boonton 92 millivoltmeter and H-P 8554-141T spectrum analyzer/i-f unit. Power measurements were made using the ubiquitous Bird 43 with 100-W, 25–60-MHz slug.

I was very interested in transmitter spectral purity, and looked at the output spectrum over two bandwidths, centering the signal at 50.000 MHz. Photos G and H are the spectral displays of the MMT 50/28S at 20-MHz/division and 2-MHz/division, while Photos E and F show the MMT 50/144 in the same bandwidths.

Note that the output of the 50/144 is exceptionally clean (for six meters), with a spur at 56 MHz falling 70 dB below the carrier. The 50/28S has a few spurs around the center frequency, with the strongest at 54 MHz falling about 45 dB below the carrier. There's a reason for this and I'll touch on it in a moment. For now, check out the numbers in the box.

I've highlighted the 1-dB compression measurements for a very good reason. They are outstanding, and if you're thinking of putting a high-performance preamp ahead of this transverter for weak-signal or scatter work, you'll appreciate what the designers had in mind.

Here's a system that will give a good accounting of itself in high-rf environments (e.g., during a contest when the band is open). The conversion gain on both units is such that neither should present an overload condition to the ten- or two-meter receivers employed at the i-f frequency. This also means more realistic S-meter readings without an attenuator.

The 20-Watt power level is ideal for driving an intermediate solid-state power amplifier in the 100–200-Watt class (such as the Mirage A1015). If 20 Watts is too much, simply cut

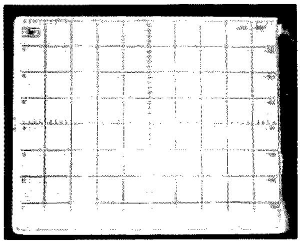


Photo E. Spectral output of the MMT 50/144. Each vertical division equals 20 MHz. The harmonic at 100.00 MHz is down −50 dB from the carrier.

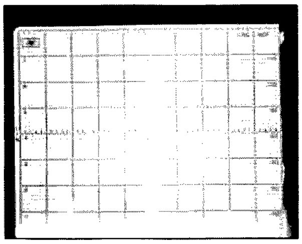


Photo F. Spectral output of the MMT 50/144 close in to the carrier. Each vertical division equals 2 MHz.

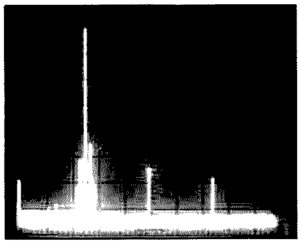


Photo G. Spectral output of the MMT 50/28S. The frequency tested is at 50.000 MHz. Each vertical division equals 20 MHz. The harmonic at 100.00 MHz is down −55 dB from the carrier.

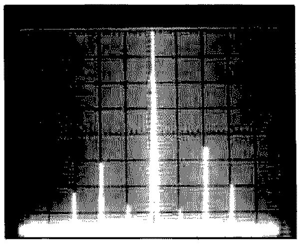


Photo H. Spectral output of the MMT 50/28S close in to the carrier. Each vertical division equals 2 MHz.

back on the injection level with the adjustable attenuator. Using this transverter with a tetrode tube power amplifier will easily result in a full kilowatt of output; the drive is a bit light for a grounded-grid system. Such amplifiers will run about 500 to 600 Watts output with either the 50/144 or the 50/28S.

I said I'd touch on the spurious performance of the MMT 50/28S, and those disquieting pips either side of the 50.000-MHz center frequency. Remember that the local oscillator (LO) here is running at 22 MHz (22 + 28 = 50). However, having the i-f so close to the LO frequency results in many close-in spurs that are harder to reject! This means sufficient output must be obtained at this frequency while considerable attenuation must be made of the harmonics that follow rather closely at 44 MHz and higher.

As you can tell from Photo H, the 44-MHz spur is down almost 65 dB from the carrier—not bad. Note also the 46- and 54-MHz spurs resulting from different mixing products. These are down 50 and 45 dB from the carrier, respectively, which is admirable since at least one falls within the skirts of the bandpass filter.

Consider the design of the 50/144 now, with its i-f at 94 MHz. It shouldn't be too hard to filter any spurious products from the LO that will fall at 188 MHz—that's 40 MHz higher than the i-f frequency. The LO is also running 44 MHz higher than the conversion frequency, so it's obvious you won't see any spurs from that area within the passband. Photos E and F bear this out. The two spurs that are evident at 44 and 56 MHz are down 65 and 70 dB from the carrier, which is more than satisfactory.

As I said earlier, you're not giving anything up by downconverting to six meters from two—heck, many of the best HF receivers available today upconvert to about 70 MHz and then downconvert so as to eliminate harmonics and improve spurious response. From an engineering standpoint, it works very well.

In Conclusion

I feel that the wait was worth it, especially since no other comparable product for 50 MHz exists on today's market. Both the MMT 50/28S and MMT 50/144 offer excellent overall performance with special attention to dynamic range and as clean a signal on transmit as is possible. The power level of 20 Watts might seem a bit light, but the spectral purity makes up for it.

Both units will lend themselves nicely to external preamplifiers as the end user sees fit, without unnecessarily degrading rf amplifier and mixer performance. Connections are easy to make (all connectors needed are supplied), the manual is well-written with several detailed schematics, and the unit is furnished in an attractive housing that looks great in the shack. Well done, Microwave Modules! Now. . . how about 432, and 1296, and. . .?

For more information about Microwave Modules' 6-meter transverters, circle number 201 on your Reader Service card.■

ICOM IC-μ2AT Two-Meter HT

ICOM America, Inc.
2380-116th Ave. NE
Bellevue WA 98004
Price class: $280

by Jozef Hand-Boniakowski WB2MIC

My wife JeanneE recently decided that she wanted to obtain a ham license. In short order she passed the Novice test and made arrangements to upgrade to Technician.

In anticipation of her passing the exam, we purchased an HT for use in her car and while she was away from home. The requirements were for a radio small enough to fit into a tote bag or shirt pocket, with ample features providing reliable access to two-meter repeaters (both PL-equipped and otherwise), DTMF tones for linking repeaters, and memory for ease of QSYing.

After looking at all the choices, we settled on the ICOM μ2AT. Small it is! The HT is 58 mm wide by 140 mm high by 29 mm deep. ICOM's ads in the ham magazines tout this by showing the radio resting in the palm of a hand.

Battery Packs

The ads, however, are a bit deceiving. They show the IC-μ2AT with the "optional" slim battery pack (BP-21) that does not come standard with the radio. The BP-21 adds 32.5 mm to the overall length of the radio, while providing 120 mAh at 7.2 V. The standard battery (BP-22) stands 62 mm tall and provides 270 mAh of service at 8.4 V. When the unit arrived, I was surprised to find out that my HT was taller than those pictured in the ads.

In addition to the batteries mentioned above, ICOM offers the BP-23 (600 mAh at 8.4 V) "for long life with normal power output of 1.6 Watts" The BP-24 (600 mAh at 10.8 V) is available for a high power output of 2.6 Watts. The BP-20 is a shell capable of holding six AA batteries or NiCds.

The problem with the shell is that although NiCds can be placed inside by the user, they cannot be charged there. ICOM probably guessed correctly that hams, being tinkerers, would buy the shell and go elsewhere for the NiCds to save money. So ICOM made it difficult to charge them. Now, since when did that kind of trick ever stop us?

The operating times of the battery packs, based on a 1:1:8 ratio of transmit, receive, and standby time, are: BP-21 two hours, BP-22 four and one-half hours, BP-23 ten hours, and BP-24 eight hours. While these figures seem to be conservative, I have found that the BP-22 is adequate for above-average HT usage.

All battery packs and the dc-dc converter slide onto the bottom of the radio and lock positively, so that there is no chance of accidental battery removal. A small slide switch under the PTT bar and LCD backlight push-button disengages the positive-locking feature.

The μ2AT comes with a plug-in wall charger supplying 27 mA of normal charge to the standard BP-22 battery. At that rate, it takes 15 hours to complete a full charging cycle. With the optional BC-50 desktop charger, at 400 mA, the task is accomplished in one hour. For mobile use a dc-to-dc converter can be purchased to produce 9.4 V dc from 13.8 V dc. This supplies enough power for approximately 1.5 Watts of rf.

Controls and Switches

Turning to actual radio operation, the μ2AT

offers you ten programmable memory channels with a backlit, green liquid-crystal display. The display is a pleasure to read both in direct sunlight and in a darkened vehicle. The green illumination can be turned on by pressing a white button just below the PTT button on the left side of the HT. An internal timer keeps the LCD illuminated for a few seconds after this switch is released.

Memory

The ten memories, unfortunately, do not store repeater offsets or simplex information independently. I find this to be the one major drawback in the use of the μ2AT. It seems silly to offer an HT with ten memories and force the user to reach to the back of the radio to set the duplex up/down/off switch to the proper position.

The standard repeater offset of 600 kHz is programmed into the μ2AT at the factory for all ten memories. It can be changed by turning the power off, setting the duplex/simplex switch to either up or down, holding down the white light (backlit LCD) switch while powering up the radio, and changing the LCD readout of 0.60 to the desired new offset. Pressing either the PTT or CHK (more on this later) switch places everything back to normal. The offset frequency can be set up to 39.995 MHz.

There are four up/down slide switches on the top of the radio. From left to right, they are memory channel, 1 MHz, 100 kHz, and 10 kHz. Frequency programming is accomplished by choosing a memory channel by number (0–9) and entering the frequency directly. The frequency entered is automatically stored in that memory channel.

There is no 5-kHz on/off switch, as the 10-kHz switch causes the LCD to increment, up or down, in 5-kHz steps. The LCD shows "0" or "5" smaller than the other numerals, at the extreme right of the readout, to indicate whether it is in effect. This simplified approach to memory programming eliminates the need for a separate entry button and/or procedure.

On the side of the radio is a frequency-lock up/down slide switch that disables the frequency-select switches, an important feature since the frequency-select switches are so small. The lock prevents accidental frequency changes.

An internal battery (good for one to two years) prevents memory from being lost during periods when the battery pack is being changed or when the μ2AT is being hooked up to an external power source—i.e., the dc-dc converter.

The μ2AT comes with a 16-digit DTMF pad on the front face and an internal subaudible tone generator for use with controlled-access repeaters or other tone squelch systems using standard CTCSS tones. The DTMF pad keys are very small, but then that's the price you pay when you buy a micro HT.

The CTCSS tones are programmed by removing the battery pack and setting a series of seven DIP switches located at the bottom of the transceiver. Thirty-eight different CTCSS tones can be set by using the tone-frequency table supplied with the manual.

However, only one tone can be selected at a time, and this is another item that cannot be programmed into memory. It would have been a sheer joy to be able to program a different tone for each of the ten memory channels. Here in central Vermont, where the New England Network links up to 14 repeaters, such a feature would be a blessing.

In addition to the above controls, switches, and LCD display, the top of the radio features a power/volume control, a (very) small squelch knob, a BNC female antenna connector, a TX/battery recharge light, and a CHK momentary push-button switch. This CHK button places the μ2AT in reverse-split mode, which is handy for checks to see if the station you're working is within simplex reach. The LCD has the typical segmented S-meter readout.

Performance

The receiver's sensitivity is good and has been more than adequate for use in the mountainous terrain of central Vermont. The receiver covers roughly from 130–170 MHz, which allows for interesting listening in the public service, weather, and other bands. Here in the snow belt, it's nice to have 162.55 NOAA weather at your fingertips and within your HT.

The ICOM IC-μ2AT two-meter HT shown with standard BP-22 battery pack.

Different 10-MHz band segments cause the LCD to display a small rectangle(s) or lack of same just to the left of the actual frequency readout. For instance, when you're receiving in the 130-MHz band, no rectangle is displayed; one is displayed for the 140-MHz range; two for the 150-MHz range; three for the 160-MHz range; and four for the 170-MHz range.

The transmitter puts out a clean-sounding signal. Audio (and convenience while mobile) can be improved with the addition of an external microphone. ICOM offers various headsets with and without VOX control and the IC-HM9 external speaker-microphone. The μ2AT instruction manual contains circuit diagrams for those wanting to incorporate other microphones or microphone elements.

The IC-μ2AT follows in the footsteps of its big brothers, the IC-2AT and the IC-02AT, in using one line for both audio and PTT functions. There are two jacks, one subminiature and one miniature, on the right side for external speaker/mike connections. The spacing between them is the same as on the 2AT/02AT, so an upgrade to a μ2AT does *not* make some external accessories obsolete.

In addition to the up/down/simplex switch on the back of the radio, there is a high/low-power switch. With the stock BP-22 battery, high power is 1 W, while low power becomes 0.1 W.

Manual

The instruction manual supplied with the μ2AT is barely adequate. It was written more for the appliance operator than for the amateur with a need for more information. There is the typical information about rig usage plus a few cautions about use of strong cleaning agents, avoiding weather extremes, etc. A most interesting quote is "DO NOT disassemble the transceiver as it may cause trouble." Now, who would do such a thing?

A Dream HT

The μ2AT, with only its few shortcomings, is an HT-lover's dream radio. The last time I saw our μ2AT was at the Albany, New York, VE testing session! My wife promptly claimed it after answering 48 out of 50 questions correctly. KA1PMS is available daily for QSOs on 145.390 MHz and on the New England Network. On her way out, someone gave her a copy of the Advanced-class ARRL manual. Who knows? Today a μ2AT, tomorrow a 50-foot tower.

The μ2AT also makes you wonder just how small a packet station can be? With a miniature GLB battery-powered TNC and a pocket computer, it would be tough to get much smaller.

ICOM also makes the IC-μ4AT for the 440-MHz band. It's only a matter of time before the complete 2AT/02AT line is duplicated in micro version. The μ2AT is an enjoyable radio offered at an enjoyable price. Now, how about a dual-band micro HT? ■

Dick Smith Electronics Function Generator Kit

Dick Smith Electronics
PO Box 2249
Redwood City CA 94063
Price class: $70

by Thomas S. Rowinski KA1MDA

As an electronics technician, I'm always on the lookout for test gear for the workbench or shack. When my forty-year-old audio signal generator finally bit the dust, I decided it was time for a new piece of gear to take its place. Luckily, I found exactly what I was looking for in a friend's Dick Smith Electronics catalog: the K-3520 function generator kit. It was inexpensive ($69.95), attractive, and had pretty decent specs.

The DSE K-3520 boasts a four-digit LED frequency display and covers 10 Hz to 170 kHz in three ranges. The specs also list an output of 2.5 volts peak to peak into 600 Ohms and an amplitude stability of .1 dB. The output waveform can be switched between sine, square, and triangle waves. Considering the price of the unit, these are impressive specs. I couldn't wait to test the assembled unit!

Assembly

The kit was relatively straightforward and went together in one very long night. I would definitely call this a two-evening kit! I don't recommend it to beginners, although anyone who has ever home-brewed a project or built a kit before should have no problems if he follows the instructions carefully.

Keep in mind that this is not a Heath-type kit. There are no parts layouts screened on the PC boards, nor are there any step-by-step instructions for assembling every piece that comes with the kit. Instead, you are instructed to mount groups of components per each step. You are told to install all the jumpers first, then the capacitors, then the resistors, etc. As long as you keep a close eye on the parts layout in the manual and highlight each component after it's installed, you should experience no problems during assembly.

The kit itself consists of three PC boards, the case assembly, and assorted hardware. The large main board is assembled first, the display board second, and the small timebase board last. Finally, the boards and hardware are installed in the case. Since the timebase board is used only in the U.S. version, it is not mentioned in the manual—it comes with its own data sheet.

I encountered only a few assembly quirks with my unit. DSE does not provide sockets for the chips: You are instructed to solder the ICs directly to the board. Play it safe: USE SOCKETS and do not install the chips until everything else is finished and ready to be powered up!

DSE also uses a strange way to label resistors: 2k5 means 2.5k Ohms. For whatever reason, the drilling template supplied with the timebase board was incorrect. Put everything else together first, then mount the board in a clear spot on the rear panel. On the front panel, the baton on the range-selector switch was shorter than the other two switches.

"The K-3520 function generator kit offers amazing performance for an even more amazing price!"

When mounting the board, insert the switch leads only far enough into the PC board to solder the tips of the leads to the foil pads. This will just about even out the length of the front-panel switches. The trickiest part of the kit involves soldering the display board to the main board at a 90-degree angle. An extra pair of hands here makes the job much easier. Tack-solder the two outside traces first and test-fit the assembly by sliding it into the case. If all is well, finish soldering the rest of the traces.

Finally, the unit is powered by a 120-volt transformer, but provides no line fusing. I installed a fuse holder on the rear panel and used a .5-A fuse in the hot line (black wire on the line cord) before the power switch for safety.

Aside from these problems, the kit went together painlessly. DSE provides more than enough solder and hookup wire to complete the kit. I want to stress that the above problems were all minor in nature, and I really enjoyed putting this kit together. Six hours into the project, I was ready to insert the chips and run the smoke test.

Test Results

My unit fired up and ran on the first try. There were a few bugs present, but it ran. The first step in calibrating the unit involved setting the timebase oscillator to 3579.545 kHz. Initially, I could not trim the frequency down far enough. Removing the 39-pF capacitor across the trimmer solved this problem. The amplitude, offset, and distortion adjustments all went off without a hitch. (The calibration procedure in the manual is written quite clearly and offers two methods of calibration—for those with and without other test equipment.)

There was a small bit of residual distortion superimposed on the output of the X100 range. I suspect it was multiplexing noise from the display/driver circuit. Bypassing the main voltage regulator ground to the power cord ground through a .5-mF, 600-volt capacitor eliminated the distortion.

Finally, the LED frequency display would not latch in the X100 range. The manual mentions this problem and suggests delaying the clock pulses with a 100-Ohm resistor. I had no luck. Through some experimentation, though, I found that a 15k-Ohm resistor in the delay line solved the problem and the display ran perfectly.

So, how did my unit compare with the published specs? It came quite close. Output was 2.00 volts p-p and was flat from 10 Hz to 25 kHz, where it began to very slowly dip down a bit. Response was down −0.91 dB at 95 kHz and −1.5 dB at 155 kHz. Range extended from 10 Hz to 155 kHz.

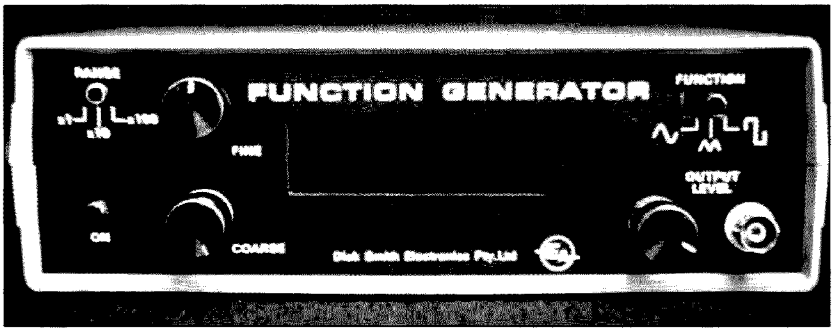


Photo A. Front panel of the Dick Smith Electronics Function Generator.

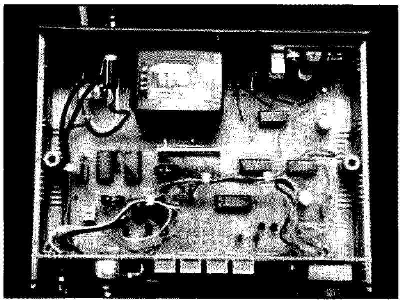


Photo B. Inside view of the completed and modified kit. Note the fuse holder at the upper left, the trimpot at the lower left, and the bypass capacitor at the bottom left behind the pots. A new frequency-adjusting pot is below the visible pot.

The digital display was accurate to ± one digit. In typical use, this resulted in a maximum indicated display error of 50 Hz at 155 kHz. From a cold start, frequency drift was −3 Hz in the first two hours. After warmup, total drift in eight hours was 1 Hz. Power consumption was 6 Watts at 120 volts. Needless to say, I was impressed with the unit's performance.

Modifications

After using the K-3520 for a few weeks, I became aware of a few shortcomings and set out to modify the kit. I found that the clean, open component layout, clear schematics, and detailed circuit description in the manual open up this kit to all sorts of modifications. An experimenter's dream!

Due to the circuit design, the frequency-adjustment range is very nonlinear. DSE tries to get around this by providing a coarse- and fine-adjustment pot. This helps a little, but it still gets touchy in spots. I found that replacing the 1-Meg linear taper "coarse adjust" pot with a 500k-Ohm, reverse-audio taper pot made the unit much easier to adjust. If a reverse audio taper pot is not available in your area, you could use a standard audio taper wired for reverse operation. It still isn't linear, but it's much better than before.

The only drawback is that this mod raises the bottom frequency limit from 10 to 20 Hz. Since I use my unit for audio work, this was not a problem. I also replaced the 4.7k-Ohm resistor in series with the pot with a miniature PC-mount 10k-Ohm linear taper pot. This modification allows setting of the unit's high-frequency limit anywhere between 75 and 400 kHz! Keep in mind, however, that this is a compromise. The higher the top limit, the more nonlinear the frequency-adjustment range becomes.

With these two mods, you can tailor the response limits to allow greatest adjustment ease for any given application. I strongly advise caution when you're experimenting above the unit's rated 170-kHz limit. Although the output stage in my kit survived numerous visits beyond 500 kHz, the output stages in a supposedly "wideband" amplifier under test did not! Above all, assemble the kit according to instructions first. Do not make any changes or modifications until you are sure everything is working as it should!

Conclusions

It has been well over three months since I assembled my unit, and I am both impressed and pleased with its performance. It is a well-designed, easy to use, and attractive piece of equipment. There are many small touches in its design that show the quality of this kit. All in all, this is a fine piece of gear. Congratulations to Dick Smith Electronics for coming up with a winner. The K-3520 function generator kit offers amazing performance for an even more amazing price! ■

Ed Ingber WA6AXX
Advanced Computer Controls, Inc.
2356 Walsh Avenue
Santa Clara CA 95051

Repeater Renaissance

Digital audio technology will bring your mountaintop monster into the information age.

Ed Ingber WA6AXX is the president of Advanced Computer Controls, Inc.

Digital audio has revolutionized the world of hi-fi and stereo. It's even turning up in the new generation of 8-mm VCRs. Ultimately, digital transmission schemes will replace today's analog frequency modulation, which is common in amateur and commercial radio communications systems. That time is still off in the future, but digital audio techniques can be applied to today's repeater—for remote recording and playback of information through the repeater.

History

Repeaters first served as relays for mobile operation. The communications range at VHF is limited due to line-of-site propagation; the range of mobile and hand-held stations is further restricted by low power and relatively poor antennas. Relaying signals from mobiles and portables and interconnecting to the phone line (autopatching) were the principal functions of repeaters until the early 1980s. At that point, repeater control systems became remotely programmable. Speech synthesis technology was introduced to repeaters at the same time.

The new combination of remote programming and speech synthesis introduced a brand new capability in amateur repeaters—the ability to convey information generated by the repeater (such as meter readings and other telemetry) and information loaded by the repeater owner, remotely. The repeater was on the road to joining the information age. . . to becoming an information center.

Digital Audio For Your Repeater

Digitizing audio on amateur repeaters for record and playback offers a different set of benefits than in the world of high fidelity. Audio fidelity is limited by various components in the radio system, such as inexpensive microphones and speakers, and, ultimately, the channel space available for transmission. Although radio audio quality is relatively "low-fi," you certainly want to take advantage of the audio quality you do have to work with. It's important not to degrade the quality of the audio that you record and play back through your repeater.

The benefits of digital audio in repeater systems spring from the fact that the audio can be stored in computer memory chips, rather than on an optical medium (such as a CD). Storage in computer memory brings with it instant "track" selection and queuing, no mechanical wear, resistance to harsh environments, full repeater fidelity, and easy remote recording. In addition you have the miraculous control capabilities of the microcomputer!

How Audio Is Digitized

Like all real-world signals, audio is inherently analog. But like any analog signal, audio can be digitized. That is, it can be represented as a sequence of digital "words" that describe the instantaneous amplitude of the audio waveform at sequential points in time.

The larger the digital word representing the amplitude, the greater the resolution, which, in audio terms, translates to a better signal-to-noise ratio and a higher dynamic range. This is because a larger digital "word" offers more possibilities for representing the amplitude, so that each representation is more accurate. Each analog "sample" is rounded off to the closest digital representation. A four-bit word allows 16 amplitude possibilities, while an eight-bit word allows 256 (see Fig. 1). At each point in time, the audio waveform is "sampled" and

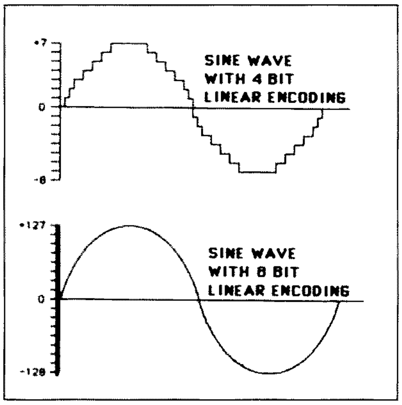


Fig. 1. Each analog "sample" is rounded off to the closest digital representation. A four-bit word allows 16 amplitude possibilities, while an eight-bit word allows 256.

Track #	Contents
14	Welcome to Silicon Valley.
15	This is WA6AXX, Repeater.
16	Press touchtone 3 6 for information about the system.
17	This is two twenty four six eight,
18	From Black Mountain,
19	Running 35 Watts above Cupertino.
20	Press touchtone 3 7 for autopatch information.
21	Listen for the Westlink Amateur Radio News, Monday nights at 7:30, right here.
22	Be sure to attend the West Valley Radio Club meeting, the first and third Wednesdays of each month at the Los Gatos Red Cross building.
23	There has been an unauthorized intrusion. The police have been notified. If you're in the repeater site area, please proceed to the site to help investigate.

Fig. 2. Audio "tracks."

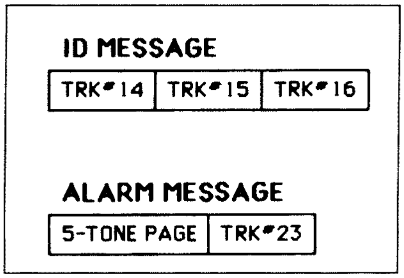


Fig. 3. Message construction with voice-recorder track.

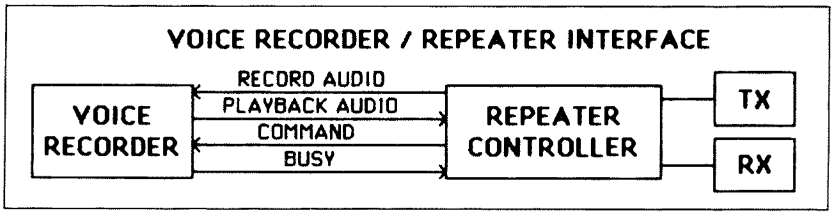


Fig. 4. Voice-recorder/repeater interface.

"quantized"—that is, approximated to the nearest digital representation.

The more frequently the audio signal is sampled, the higher the frequency signal that can be accurately reproduced. If a 1-kilohertz signal is sampled only every few milliseconds, then there isn't enough information obtained to reconstruct the signal accurately.

An analog signal needs to be sampled at a rate at least twice the highest frequency component that needs to be preserved. All the frequency components above half the sample rate should be filtered out before the signal is sampled. Otherwise, these signals "wrap around" and appear as "aliases," or in-band noise and distortion, which cannot be removed once recorded.

Compact disc systems use 16-bit digital words sampled at 44.1K samples per second. This provides for a 96-dB dynamic range and signal-to-noise ratio, with frequency response extending past 20 kHz—quite an improvement over LPs! For your purposes, you simply want to preserve the full fidelity of your amateur repeater when it is digitally recording, so that a 50-dB signal-to-noise ratio, 1% or so distortion, and 4-kHz frequency response will sound identical to the original.

Data Compression

You want to store your audio in as little memory as possible without compromising the audio quality you obtain through your repeater system. That means that you can borrow a simple data compression technique used in the telephone industry called "companding."

This clever technique lets you use fewer bits to represent each analog sample by compressing and expanding the signal during the analog-to-digital and digital-to-analog conversion process. This effectively reduces the dynamic range needed to represent your digital word. With companding, you can use an eight-bit word to achieve the performance of a non-companded, or linear, 12-bit word.

The analog-to-digital converter performs this compression by varying the quantizing step size over the amplitude range. Small signal voltages are quantized around small step sizes, while larger voltages are encoded around larger step sizes.

Direct analog-to-digital conversion of the audio signal, including the use of companding, is called waveform encoding. Other techniques exist for compressing the amount of digital data needed to store voice audio. This is because the human voice contains a large amount of redundant information. Other than companding, these techniques generally degrade the perceptible quality of the audio, relative to high-resolution waveform encoding.

Some data compression techniques, such as CVSD (continuously variable slope delta modulation) and ADPCM (adaptive differential pulse code modulation), involve hardware or software and rely on certain predictable characteristics and the built-in redundancy of human speech. These techniques are used in some communications systems where intelligibility, intonation, and naturalness need to be maintained, but where distortion and signal-to-noise ratio can be compromised.

Other techniques, such as LPC (linear predictive coding), achieve a high degree of data compression using extensive digital signal processing. Rather than encoding the voice waveform, LPC involves modeling the human vocal tract. Instead of storing waveform samples, parameters for the human vocal tract model are stored and require much less data.

The price paid is encoding complexity. Some speech synthesizers are actually digital voice playback devices using LPC for data compression. LPC will probably eventually be used in low-bandwidth digital voice transmission systems for two-way radio applications.

While data compression can preserve "communications quality" audio, you don't want your recorded audio to be simply intelligible—you want it to sound like the original. Companded PCM (pulse code modulation), or waveform encoding, offers what you're looking for.

Most data-compression techniques work at the "front end" as part of the recording process. By recording the digitized waveform directly instead, you retain the option of data compression using software before you store the information. In that way, you can preserve the full fidelity of the original for important, frequently heard recordings, and you can conserve memory for less important recordings where you can tolerate some degradation.

The conversion of an audio signal to digital words and back to an analog signal using companded PCM can be done with readily available chips called CODECs (short for "coder-decoder"). These chips are used in most digital telephone systems and PBXs. They've been available since the late '70s and have evolved in ease of use and performance. The 2916, a CODEC chip made by Intel, represents an advanced design. All CODECs are designed to meet or exceed telephone industry standards, and also happen to meet or exceed FM repeater audio standards.

Integrating Digital Audio Into an Amateur Repeater

The most obvious application of digitally recorded audio on a repeater is for its ID messages. In keeping with the goal of making the repeater an information center, the ID can be tagged with information of interest to the amateur community. If there's a club meeting later in the week, the ID can remind users of the meeting. The scheduled speaker for the meeting can record the ID and quickly promote his talk. It is important, however, that the repeater controller ensure that the announcements do not interfere with repeater users.

Other repeater messages can be remotely recorded to contain information of interest to users—tail messages, bulletin board messages, alarm messages, etc. These can contain information about meetings, nets, emergency situations, etc.

Voice Mailbox

Another obvious application of digital audio is in implementing a "voice mailbox." Large-scale digital audio systems attached to telephone PBXs provide a company's employees with enhanced communications by allowing them to leave digitally recorded voice messages. This helps eliminate the "telephone tag," which so often occurs in an office environment. On amateur repeaters, a user to whom you might like to mention something or ask a question may not be around when you are. A voice mailbox would let users exchange questions and information in non-real-time.

In addition to providing information to users, the repeater can be made more "friendly" by offering holiday greetings to users, featuring celebrities saying the IDs, introducing newcomers, and congratulating members on their good fortunes. If the repeater's courtesy tones are remotely programmable, distinctive sounds can be recorded to serve as the courtesy tone. In some repeater controllers, the courtesy tone can be a source of telemetry, or information relating to repeater or equipment status.

Talking to Yourself

Perfect audio reproduction will allow users to record a brief transmission so that they can hear how they sound through the repeater. This is useful for checking the audio quality of a new microphone or hand-held or

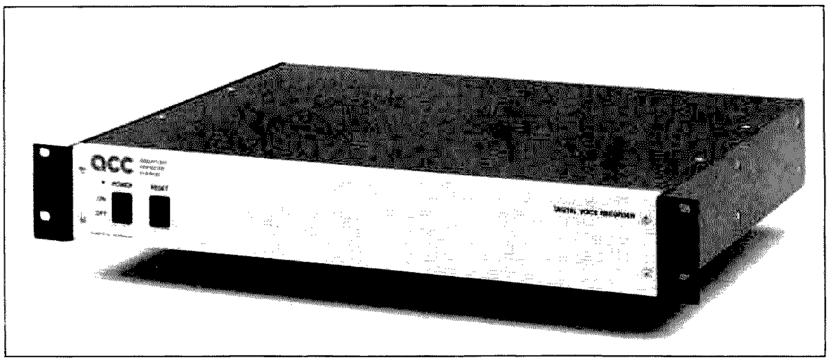


Photo A. This Digital Voice Recorder is made specifically for repeater use by Advanced Computer Controls.

High Fidelity	Repeaters
Freedom from surface noise	Instant track selection and queuing
High dynamic range	No mechanical wear
Ultra-low distortion	Resistance to harsh environments
No wow or flutter	Full repeater fidelity
No degradation	Easy remote recording
	Synergism with microcomputer

Table 1. Benefits of digital audio in hi-fi vs. repeaters.

to hear how well messages are getting into the system.

The Audio "Track"

Audio in a voice storage unit must be organized in a way that separates various recordings and makes them available for immediate use on demand. The simplest way to think of the unit of storage is as an audio "track."

The track is similar to, but differs in important ways from, tracks on an eight-track cassette player. In your digital recorder, each track contains a specific recording. The track is automatically made long enough to hold the audio you've recorded, and no longer. By automatically varying track length to match the particular recording length, you don't waste memory. Each track is immediately available for playback when commanded. Your microcomputer controller can provide for as many tracks as you'd like, since they're simply logical entities.

When a track is deleted, its space in memory is freed up to be available the next time you record that track or any other track.

Message Editor

Sophisticated repeater controllers with remote programming capabilities include a "message editor," which allows the repeater owner to remotely program the various messages generated by the controller. The remote programming can be accomplished with touchtone™ commands. The programmable messages can consist of Morse code, synthesized speech, paging tones, digital voice recorder tracks, and other external devices.

Using the message editor, you can construct IDs, tail messages, and bulletin boards that include voice recorder tracks. You can even join various voice recorder tracks together, so that some information needs to be recorded only once (such as the repeater's callsign), but can be used in multiple messages.

As an example of an ID message that you can construct using the tracks recorded in Fig. 2, join tracks 14, 15, and 16 (as shown in the top half of Fig. 3). The resulting ID playback is "Welcome to Silicon Valley. This is WA6AXX, Repeater. Press touchtone 3 6 for information about the system." You can also use these tracks in combination with other tracks in other messages, such as additional IDs and tail messages.

Another example of a progammable message is the repeater's response to an alarm condition (see the bottom half of Fig. 3). If an intruder breaks into the repeater building, the repeater can respond by announcing a preprogrammed alarm message.

Using the message editor, you can construct an alarm message that consists of (1) paging tones, to activate the control operators' selective call decoders, and (2) a digital voice recorder track that provides information on what to do in the event of the intrusion. The resulting alarm message might be "[five-tone sequential page]. There has been an unauthorized intrusion. The police have been notified. If you're in the repeater site area, please proceed to the site to help investigate."

Conclusion

The combination of sophisticated repeater controllers and digital audio recording techniques have resulted in another step in the amateur repeater's evolution into an information center. And they make operating a modern amateur repeater a lot more fun! ■

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Packet RATS

WA3DNM's Resume-After-Transmit Scanner lets your IC-27A do double duty.

Shortly after joining the growing ranks of packeteers, I discovered that there was more packet activity in eastern Pennsylvania than first meets the eye. Activity is spread across 145.01, .03, .05, .07, and .09 MHz, so I quickly put the scanning feature on my ICOM IC-27A to good use monitoring the activity on all channels. My packet station consists of an ICOM IC-27A transceiver, a Kantronics Packet Communicator II, and a Radio Shack Model 100 portable computer acting as a terminal.

I like to leave the radio scanning the five active packet frequencies. My favorite command on the Kantronics Packet Communicator II is MH (monitor heard), which lists the last 18 stations heard, and with this command I can determine who has been active most recently.

After connecting with Bruce WA3WUL, who has extensive packet experience, I found out that my station location in Media is to be envied as a good digipeating location. Now, I realize that an elevation of 445 feet above sea level may not seem high to hams in the Rockies, but it is a Mount "RFerest" to the unfortunate packet operators living in this area's many rf holes and valleys. Bruce lives in one of this area's deepest valleys (Delaware), so I offered him the use of my station's digipeating capabilities (DIGI ON)—and with it my reliable access to the Delaware Valley's other packet stations.

Problem Time

When Bruce used my digipeater capabilities, he could connect to whomever he wanted, through my station, on whichever packet frequency he needed. By breaking the squelch and causing my radio to stop scanning, Bruce had a five-frequency digipeater.

Unfortunately, the 27A does not resume scanning after transmitting. So when Bruce digipeated through my station, the scanning stopped and the radio was stranded on the last transmit frequency until I happened to pass by the shack, notice the lack of scan activity, and restart the scan by pressing the S/S (start/stop scan) button. This, in effect, nullified my MH capabilities and doomed my digipeater to only intermittent, multi-frequency capabilities.

The Plot Always Thickens

A few months later, I installed a mini-mailbox system for the Model 100, written by Dick Roux N1AED. I started discussing my newfound capabilities to store messages with several friends and heard that Harry ND2P had only .01 crystals (he has since sprung for .03, as well), and Abe N3BBF could reach my station only via a digipeater in New Jersey on 145.05 MHz. Bruce still often digipeated through my station to access WB2MNF on .03 and K3PGB on .05. The only one who did not really care (except for academic interests) was Jon KR3T, who also had an IC-27A and could access me directly. Thus, I needed to cover several frequencies continually. The problem with the 27A's scan lock-up after transmit had to be resolved.

The Solution Is RATS

Enter RATS—Resume-After-Transmit Scanner. After a session reviewing 555 timer circuits plus the 27A's schematic, I discovered the answer to my problem in the form of an easily constructed 555 timer circuit. I even interfaced the RATS without soldering or modifications to the 27A. My RATS lives in a small plastic box on top of the radio; thus, no internal modification to the radio is needed. If you use the component and voltage values shown in the circuit in Fig. 1, the IC-27A will resume memory scan approximately 1.5 minutes after the radio's last transmission.

Construction

There is nothing unusual about the 555 timer circuit. It is a basic and time-proven design, based upon a circuit found in the Radio Shack 555 timer book (*Engineer's Mini-Notebook 555 Timer IC Circuits*, Forrest M. Mims III, P/N 276-5010). When pin 2 of the 555 goes to ground, the output goes high and the normally closed relay contacts

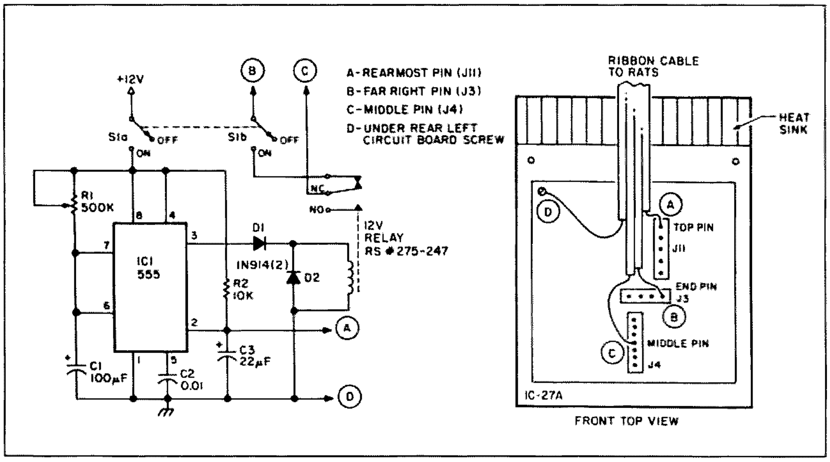

Fig. 1. Schematic and connections for RATS, the resume-after-transmit scanner.

open. After a period of time determined by the R1/C1 combination (which can be adjusted to suit your needs), the 555 resets, reclosing the relay contacts. This closes the S/S switch, causing the radio to resume scanning the memory channels.

My RATS was constructed using point-to-point wiring. I used four-conductor, multi-ribbon cable to connect RATS to the radio. After coating the four wire ends of the ribbon cable with enough solder to make a tight connection, I friction-fit the wires into the top of the necessary circuit board connectors on the radio's top board. I routed the cable over the 27A circuit board, out the back, and over the top of the heat sink. The top cover can be reinstalled with no difficulty, and it holds the connecting wires in place.

> ***"An elevation of 445 feet above sea level may not seem high to hams in the Rockies, but it is a Mount 'RFerest' to the unfortunate packet operators living in this area's many rf holes and valleys."***

Proper connections to the radio are shown in Fig. 1. Power for RATS comes from the same external, 12-volt power supply that powers the radio, although you may want to get power from inside the radio using two additional conductors.

Operation

After programming the packet frequencies into the memory (I fill the extra memories with duplicates of .01 and .03 since they are the most active), turning on RATS causes the scanning to start. Everything appears normal, except that now, 1.5 minutes after transmitting, the 27A will resume scanning. When RATS is active, the S/S switch is disabled, since the relay shorts across the switch contacts. Turning off RATS will allow normal S/S operation.

Happy Ending

Now everyone is happy. My radio continually scans its little heart out, digipeating and collecting or dispersing mail on all five frequencies. In addition, it still monitors all five frequencies for activity, preserving the MH function I like so much. The station provides service to all, without short-changing any of those needing a little help from their friendly digipeater. Now if I can only think of a way to remotely turn off all those beacons that fill up the MH log. ■

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The Fakeroo

Can this kid really copy RTTY by ear or is someone pulling the old fakeroo?

It seemed pretty clear that somebody out there was after me. But I didn't know who, and I didn't know why. And I still don't.

I decided I must be on somebody's hit list when this young kid showed up in my shack claiming to copy RTTY by ear. He had to be faking it, of course, though I haven't figured out how. And because he was a perfect stranger, it was clear that somebody else must have put him up to it, probably to get the laugh on yours truly.

The reason this is so surprising is that I'm such a nice guy, no pun intended. If I were a surly SOB or a really nasty person, I could understand somebody laying in wait for me. But I'm not. See, I never hog frequencies, laugh at lids, ridicule guys with rotten rigs, swap Novices my junk for their goodies, cheat Silent Keys' widows out of their husbands' gear, tune up on top of QSOs, or run a gallon to work local traffic.

We all know a lot of rotten amateurs who can't make such claims without crossing their fingers. And any one of them would be fair game for a gag aimed at giving him his comeuppance by making him look silly. Heck, we'd be happy to help. But none of these guys is the target of this apparent ham scam. I am.

I keep asking myself, could it be W9PBS, trying to lay one on me because I haven't been back yet to ring out all those rotor leads I promised to reconnect when I had to cut them last fall to replace the storm window in his shack that I accidently smashed with an 807? Could it maybe be W9ODM, still sore about the meter I blew in his noise bridge that never nulled worth a hoot anyway? Or could W9PLW be behind it, irked because I lost the dang operator's manual and schematic he loaned me? I just don't know.

Anyway, whoever it is, he picked a poor way to put me on. I wasn't born yesterday, you know. So I didn't fall for this kid claiming to copy RTTY in his head.

Anybody can recognize the sound patterns of CQing or RYing in Baudot or ASCII, but nobody can actually copy that high-bit, low-bit stuff, right? And if somebody comes along who seems as if he's reading RTTY solid at 60, 67, or 75 baud, then apologizes for missing a letter here and there at 100, he's got to be pulling your leg, right?

Bet the rig on it, friend. And the farm, if you own one. It's pretty nearly a sure thing you've got a fakeroo on your hands.

> ***"I decided I must be on somebody's hit list when this young kid showed up in my shack claiming to copy RTTY by ear."***

My fakeroo said his name is Carlos, Carlos Ramos. He looked to be about 16, give or take. He told me he's a junior in the local high school, and said he was boning up to try for his ham ticket. He seemed like a real bright kid and a nice one to boot, except he wouldn't admit he was pulling my leg or tell me who was behind the gag.

Carlos materialized in my basement shack one Sunday afternoon while I lounged back in my swivel chair chatting with a buddy on the local two-meter machine. I heard footsteps behind me, swung around, and there he was, just inside the doorway. He was staring over my shoulder at the radio gear, his eyes shining like overvolted LEDs.

"Hi," I said, cutting off the transceiver's audio and extending my hand to shake his. "Come on in. Pull up a chair."

"Your...uhh...lady saw me lookin' at your beam outside," the kid said, sounding embarrassed. "She invited me in and sent me downstairs here."

"Standing orders," I said. "Visitors welcomed. Name's Guy. What's yours?"

The kid told me, allowed his hand to be shaken without contributing anything to the motion, but never looked me in the face. That's because his eyes were scanning the radio equipment and the two Commodores on the operating table.

"Excuse me a minute while I hang up with my friend," I said, turning the gain back up on the two-meter rig. "You a ham?"

The kid shook his head, mumbled that he was working on it, and switched his gaze to the transceiver as audio burst from its speaker.

"...pop a fuse or get a landline or what?" the radio was asking. Then it went silent.

"Sorry," I said, keying the mike. "Neither. Company in the shack. Young visitor name of Carlos. He's gonna have a call of his own one of these days." I held the mike to the kid's face, prompted him with, "We're chatting with John across town, Carlos. Tell him hello."

The kid didn't. His face went white. He swallowed a couple of times, but didn't say anything. I recognized the symptoms of classic mike fright, remembering its terrors from a long time ago.

"Carlos says hello," I told the mike. "Listen, John, I'll let you go for now and catch you later. Have a good one. This is K9AZG shutting down. Ciao."

Switching off the radio, I swung around to face the kid, waved at the chair in front of the word-processing equipment at the far end of the operating table from the radio gear.

"Sit down, Carlos. And relax. You look uptight."

"I guess I am," the kid said, not moving. "I've never been in a...uh...ham station before. It's...uh...scary."

"Shouldn't be," I said. "This is just run-of-the-mill gear, nearly all of it commercial."

"It looks so expensive," the kid said.

"Not really," I said. "The price of a good used car buys it all. Anything here you don't recognize?"

The boy shook his head, said he'd seen the separate pieces of equipment in magazine ads, but still found the collection awesome.

Remembering my own frightening first glimpse of a ham station—W9NVH, Milwaukee, 160-meter AM, kilowatt, 1932—I knew where he was coming from.

"Here," I said, switching on the low-band transceiver and getting up from the operating chair. "Sit down. Tune around. That's a Kenwood TS-830S."

Carlos sat down. The Kenwood was on 20, lower sideband. The boy tuned in a RTTY signal on 14.086, sat there apparently enthralled by the burbling.

I reached in front of him to turn on the master switch powering the monitor and the RTTY terminal to his right, flipped on the C-64, punched "SYS32768," then "RTTY," into the keyboard. Letters started marching across the bottom of the green display, and completed lines began scrolling upwards.

The boy paid no attention to the monitor. He was staring vacantly at the transceiver's frequency-readout display in front of him. But his lips moved in apparent synchronization with the letters forming on the screen 45 degrees to his right.

"Hey," I said. "What are you doing?"

"Reading...uh...the mail," the boy said. "Isn't that what you call it?"

"Yes." I said. "That's what you call it." My voice sounded brusque, even to me. "But how can you be reading the mail?"

"Did I do something wrong?"

"That's RTTY," I said. "You're copying it in your head? Baudot by ear?"

The boy nodded.

"ASCII gives me trouble," he said apologetically. "Capital letters mess me up."

"Whoa," I said, suddenly sensing the pulling of a leg here and realizing it was mine. A strange kid stumbling into the shack, a beautiful mike-fright act, and a lad reading RTTY in his head. Wow! They almost got me.

I looked around for a hidden camera, realized none could have been planted here in my own basement without my knowledge, and tried a different tact.

"Okay, kid," I said sternly. "The act's over. Who sent you?"

The boy looked frightened.

"I told you," he said, speaking all in a rush. "I was walkin' by and I saw your beam and I stopped to look at it and your lady made me come in and..."

I decided to change my tactics. If I couldn't scare anything out of him bad-guy style, I'd switch to the good-guy routine that so much better fits my normally sweet nature.

"Sorry, Carlos," I said, friendly again. "I didn't mean to snap at you. You startled me. We both know you can't copy RTTY in your head. Only you were faking it so well you shook me up."

"I wasn't fakin'," Carlos said, looking confused. "I can too copy RTTY in my head. Some, anyway. I do better with pencil and paper, though, because that's how I practice for my ham-ticket exam."

"Uh huh," I said.

"They do allow paper and pencil for the Morse, RTTY, and ASCII parts of the test, don't they?" the kid asked.

I pretended not to hear him, maintained my friendly smile, and prodded, "So just between us girls, Carlos, who sent you?"

"Nobody. I told you. I was walkin' by..."

"Okay, okay," I said, smiling my chummy smile. "Tell you what. You move over there to that chair by the word processor and let me key in some RTTY you can copy for me."

"Not too fast, please," the boy said, moving down to the far end of the operating table. He picked up a pencil and poised it over a scratch pad. "I'm a little nervous. Anyway, I start losing some around 75 baud because I can't write fast enough."

"We're set up for 60," I said. "Here we go."

"I craned my neck to read what he had scrawled. The sly red fox routine. Verbatim. The way I sent it. Even the typing error."

I swung the monitor to face me at the operating position, knowing the boy couldn't see it from where he sat. I turned the transceiver mike gain to zero to avoid putting a signal on the air. Then I keyed into transmit mode and began punching the sly red fox routine.

The boy cocked his ear at the station speaker and started to write. I finished, craned my neck to read what he had scrawled. The sly red fox routine. Verbatim. The way I sent it. Even the typing error.

"Lucky guess," I told myself, realizing that in the past someone could have bothered to copy my red fox messages often enough to know what part of it I always mess up.

Punching up a brag-tape from disk storage, I keyed the transmitter on. The system began burbling away, automatically chronicling my age, my accomplishments, my ham history, my equipment, my family ties. I got up to look over the boy's shoulder.

His pencil was racing across the paper, getting it all down. Word for word. Perfect copy.

"Of course," I told myself. "I've sent that tape over the air a hundred times. The gagster recorded it and made the kid memorize it."

The brag-tape message ended, and the RTTY gear began sending nulls. I keyed it off and went to work on the boy again.

"You're good, Carlos," I said. "You're very good."

"Thanks," the kid said, looking pleased. "I practice a lot. I listen all the time on my Sky Buddy."

"Sky Buddy?" I said, pouncing. "Aha! Gotcha! That's an obsolete old tube radio that doesn't even have a product detector. It couldn't possibly provide decent RTTY copy."

"I know," the kid said, shaking his head sadly. "It ain't very good. I can only read RTTY on 80. It drifts too bad on the higher bands. And the bfo jumps frequency a lot."

That's when I blew it, losing my temper for the moment, something I almost never do because I'm just too nice a guy.

"Listen, kid," I said, looking around for some kind of a club to threaten him with. "Drop the act. Tell me who sent you, or I'll beat it out of you!"

The boy took off.

I could hear his shoes slapping the floor, up the stairs, down the hall. There was the distant slam of the front door and then silence.

The intercom speaker came to life.

"Everything all right?" my wife's voice asked.

"Sure," I told her, holding down the talk button on the box. "Why?"

"That boy," the voice said. "He flew by me and out the door as if he were pursued by demons."

"There aren't any demons down here," I said, feeling like one. "Just me."

"He sure acted scared."

"Acted is the key word," I said. "He was putting you on. And me, too. What a fakeroo! Claimed he can copy RTTY in his head."

There was a long pause. Then my wife asked, "Is that hard?"

"Yeah," I told her. "It's real hard. You got a high-school directory up there?"

"Teacher or student?"

"Student. I need a home address for that kid. Junior class. Name's Carlos Ramos."

"Why?" the voice asked. "You want to scare him some more?"

"No. Like I said, there aren't any demons down here," I told her, still feeling like one. "I want to send him a present."

"What kind of present?" the intercom asked.

"A decent ham-band receiver. Second- or thirdhand. Whatever I can pick up for a few dollars. And a license manual."

"Why?" the voice demanded.

"The receiver because every kid deserves something better than a worn-out Sky Buddy. And the manual to show this particular kid that RTTY and ASCII aren't part of the license exam."

"He thinks they are?" my asked asked.

"I'm not sure," I told her. "A real fakeroo would know better. Carlos...maybe not."■

John LaMartina K3NXU
RD1 Box 1882
New Freedom PA 17349

Semi-Rapid HT Charging

This is the 8-hour option ICOM didn't tell you about—and no soldering is required.

If you own an ICOM hand-held, you are aware that the battery supplied, as well as those available as options, allows for only two types of charging capability. The normal charge rate requires 15 hours, while the rapid rate gets the job done in one to two hours. Until now, there was no compromise. If you use your HT from morning to evening, with only eight hours of charge time available at night, try the Semi-Rapid Charge alternative.

What this requires is the BC-30 or BC-35 charger and ICOM's least expensive battery option, the BP-4 alkaline-battery case. The BP-4 case holds six AA battery cells and is compatible with both series of ICOM hand-helds.

The semi-rapid charge option requires no physical modification to the charger itself, but rather to the battery case. There's no need to plug in the soldering iron.

NiCd Battery Selection

The NiCds needed are readily available off the shelf (Radio Shack 23-125 rechargeable Enercell). Be sure, however, that you acquire cells that meet rapid-charge requirements. Standard NiCds will show a charge rate of approximately 45 mA for 14 hours. NiCds capable of rapid charging will also show an additional fast-charge rate—i.e., 150 mA for four hours. This should be plainly printed on the cell's jacket. What this is saying is that this NiCd will accept a maximum charging current of 150 mA. Warning: Never exceed the maximum recommended current for charging. This will cause the NiCd to overheat and become severely damaged.

The Charge Rate

The current required to charge a NiCd is relatively easy to compute. The total amount of charge current required is approximately one-third more than its total current capacity. For example, a NiCd with a capacity of 450 mA will require a total of 600 mA of charge over a given period of time. With the battery charging at 45 mA, the time would be about 14 hours (45 x 14 = 630). Charging at 150 mA would require only four hours (150 x 4 = 600). For this project, the rate that we are concerned with is 70 mA for 8-1/2 hours.

"The semi-rapid charge option requires no physical modification to the charger itself, but rather to the battery case."

The BC-30 and BC-35 Chargers

There are three available charge rates when you are using the ICOM charger: 25, 45, and 600 mA. The selection of the proper charge rate is determined by the notched key on the bottom of the battery pack. The BP-4 is set up to automatically select the 45-mA charge rate.

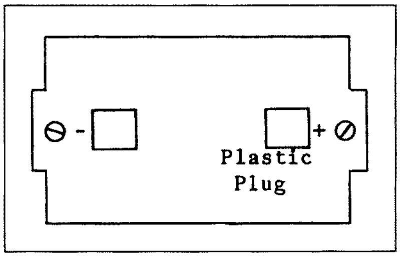

Fig. 1. The bottom of the BP-4 battery pack.

By design of the BC-30/35, if both the 25- and 45-mA switches are selected simultaneously, the charge rate becomes 70 mA. Now the pieces should all be fitting together.

The Actual Modification

On the bottom of the BP-4 battery pack, you will notice that there are two squares notched into the plastic case (Fig. 1). You will also note that each of the screw terminals is marked, one positive, the other negative.

Cut a small piece of plastic about 1/16-inch thick to fit into the square on the positive side of the case. One drop of glue is all that will be necessary to complete the modification. If you have the older style BP-4 battery case, which splits in half, separate the two sections before gluing to avoid permanently bonding the two sides together.

After the piece of plastic is glued into place, trim the plastic to be smooth and level with the bottom of the case. This is necessary to ensure that both switches are depressed when the battery is inserted into the charger.

Conclusion

This modification lets you enter into the world of the semi-rapid charged NiCd. What you now have is a battery pack that should last through an entire day's use (450 mA) and one that will charge to maximum while you sleep. My XYL, Linda WB3EBD, no longer worries about the HT dying after dinner due to an undercharged NiCd.

Note: To prevent damage to your battery, be sure to remove the NiCd from the charger after eight hours. Remember, there is no over-charge protection on the BP-4. ■

William Bruce Cameron WA4UZM
324 S. Riverhills Drive
Temple Terrace FL 33617

Revive A Dying Swan

Haul up your boat-anchor Swan 250 and give it new life with a home-brew vxo.

With six meters occasionally active and the dollar-to-yen ratio making Japanese radios more expensive, some hams are looking at old U.S. gear and wondering. The Swan 250 (a.k.a. the Swan too-drifty) is cheap but has not improved with age. At some hamfests, the seller may include a rope to tie it to your boat.

It is not a bad design, except for the vfo, which was conceived with incredible optimism. Have you ever built a vfo on 13.1 MHz that multiplied to 39.3 and was stable enough for SSB? Not bloody likely, as our Aussie chums might say. Well, I looked on it as a challenge, and now and then I win one.

The Vxo

Although it is terribly difficult to build a vfo for these frequencies, it is easy to build a vxo. Vxo? In the 1930s, we called it a rubber crystal. It is a combination oscillator with some of the stability of a crystal and some of the flexibility of a self-excited oscillator. (Master oscillator, ECO, vfo, or whatever they called it in your day.)

There are several designs that work, but the one I prefer is derived from the Colpitts oscillator. That is the one that uses capacitors to divide the rf for feedback. It is what you usually find in a grid-dip oscillator that uses two-pin (untapped) coils. If you plug in a crystal in place of the coil, it becomes a Pierce oscillator, and you can vary the frequency a bit with the tuning capacitor. If you put a coil in series with the crystal, you can move the frequency more.

There is a maximum capacity you can shunt across the crystal before it stops oscillating. A 150−150 split stator will give you more than you need. Output drops as you increase capacity. The range depends mostly on the coil, but if you use too large a coil, you get just another unstable oscillator. I wound 30 turns of #28 enameled wire on a 3/8" slug-tuned ceramic form.

Each crystal can be pulled 5 to 8 kHz and thus will cover 30 to 50 kHz at the signal frequency. If you want a wide range, you will have to invest in a number of crystals. I built my vxo out of the junk box, but as I have played with radios since 1932, my junk box may be older and larger than yours. If you have friends as old as I, they likely have suitable crystals lying around. If not, try Jan Crystals (PO Box 06017, Fort Myers FL 33906; 813-936-2397). They have thousands of them and would be delighted to sell you a few. Exact frequencies are not required.

Circuit Design

The circuit in Fig. 1 is almost self-explanatory. You could build it with transistors if you preferred, but the Swan is tube gear, so the voltages are already available. The tube can be any hot pentode. A 12AU6 is a good choice, but I used a 6BH6 with a #47 bulb in series with the filament. Use what you have handy.

A 12-position switch will allow for lots of crystals. I used a National Velvet vernier dial for the capacitor, and the 5:1 ratio makes for very easy tuning.

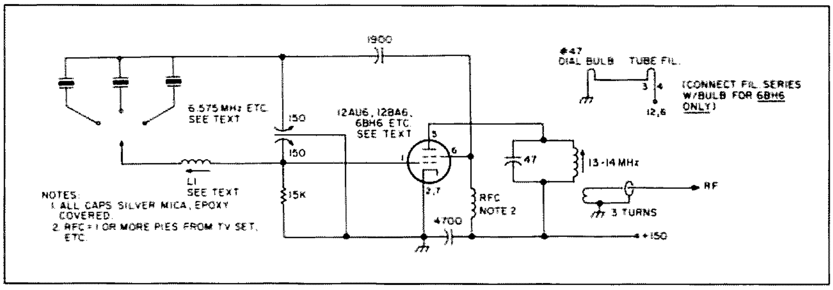

Fig. 1. The vxo circuit.

There is no need to try to cram all this stuff into the original vfo box on the Swan. Besides, if you did, you might spoil its resale value! I built it on a 5" x 9" x 3" chassis with everything underneath except the tube. The crystals were two kinds: some HC6Us and some old CR1As left over from World War II. I taped them together, with cardboard spacers between the HC6Us (which are not flat), and then clamped the whole bundle to the chassis with a strip of aluminum flashing. Sockets are a needless luxury in a project like this. Solder hook-up wire to the pins.

A three-wire power cord and a matching length of small coax (such as RG-174/U) connects to the rear of the Swan with an octal plug. There is already a hole marked "accessory" that is punched for the socket. The coax continues to the 6EW6 tripler, and the outboard rf generator replaces the internal vfo and its amplifiers.

Lift one end of C1809 (430 pF) from the transistor buffer and attach it to a tie strip added to the chassis. Connect the center of the coax to this and ground the braid. Pick up regulated 150 plus from the left end of the 6k-Ohm register, which may be marked #458 or R1606. (The other end is tied to #427, 400 Ohms.) Get the 12.6 V ac for the filament from pin 3 of the marker oscillator if your rig has one, or from the nearest other source. Change R101 from 47k to 100k for more drive.

The Swan 250 has an i-f of 10.7 MHz and uses low-side oscillator injection. To estimate the highest frequency a given crystal will tune, multiply the series-resonant frequency of the crystal by six and add 10.7 MHz. Thus, a 6.575 crystal will tune from approximately 50.150 down to about 50.110, depending in part on the gain of the circuit and the activity of the crystal. Some of this must be determined empirically, which is a fancy way of saying "cut and try."

Even if you have no interest in this particular rig, keep the vxo approach in mind. I have used it successfully on several pieces of gear as far removed as two meters and 160. ■

NEVER SAY DIE

from page 11

them—particularly in Taiwan and Hong Kong.

6) Remember, the dollar is still powerful in Taiwan, Korea and Hong Kong, so the shopping is outstanding. Hong Kong is where you buy cameras and electronic gadgets.

7) I plan on being along. I've been there a dozen times, so I know the ropes. This can help if it's your first trip to Asia.

8) Despite the appreciation of the yen, Commerce Tours has been able to hold the price down to a semi-measly $3130 for the tour. Yes, you can custom design the tour if you want—say, skipping Osaka or Hong Kong. This is one of the best travel bargains I've seen—which is why cheap. . .er, thrifty me loves it. It's great to go to first-class hotels and pay so little.

Now look here, we want no cheating on trademark and publishing royalties, so you have to promise not to stock up on Taiwan Rolexes and book knock-offs. I can't imagine why anyone would ever buy a $25 imitation Rolex, even if it keeps better time than the real thing and could fool a jeweler. Disgusting. Only people with very weak characters, or show-offs, would buy such things and smuggle them into the U.S. Tsk.

9) The tour usually attracts from 150–250 electronics-oriented men and their wives. Most are from the U.S., but we've had groups from Europe and Australia join us. Great bunch of people—you'll make some good contacts. There are usually a dozen or so hams on the tour—and, if you want, you can bring an HT and get a license in Hong Kong.

10) As long as you're already in Asia, why not extend your trip a few days? We can arrange a two-day extention to the Canton Trade Fair in China—and yes, they sell things there. For instance, you won't believe carpet prices—bring your room measurements and have the carpet shipped home. You might even be able to pay for your trip. Or perhaps Beijing for three days so you can climb the Great Wall. There's an electronics show in Singapore—how about a couple days there? Hey, you only have one lifetime, so don't let a minor thing like work stop you from taking a few more days and storing up memories.

The tour runs two weeks, starting October 3rd from the U.S. and returning from Hong Kong the 18th. Don't forget, you gain a day coming back.

If you're interested, check out the ad on the facing page and send in the coupon or call my 800 number so I can have Commerce Tours send you a brochure. Who knows, you might grab me at breakfast one morning and get me to come up with some new ideas for your business.■

SPECIAL EVENTS

RUN FOR THE ROSES
MAY 1–2

The Louisville, Kentucky, ARTS will operate the "Run for the Roses" under the call W4CN from 2400 to 0500 UTC on May 1 and from 1300 to 1700 UTC on May 2. Suggested frequencies 21.125 Novice, 21.325–14.250 SSB. For a commemorative certificate, send a QSL and an SASE via ARTS Club W4CN, PO Box 7391, Louisville KY 40207. No. 10 envelope for folder or 9 x 12 for unfolded (39¢ postage).

FRESNO CA
MAY 1–3

The Fresno ARC will hold its 45th annual Hamfest at the Fresno Airport Holiday Inn on May 1–3. There will be demonstrations and forums, and FCC exams will be given. Talk-in on 146.34/.94. For additional information, contact Glen T. Caine, Fresno ARC, PO Box 783, Fresno CA 93712; (209)-292-4811.

SIERRA VISTA AZ
MAY 1–3

The Cochise ARA will hold its 1987 hamfest on May 1–3 at the club's training facility on South Moson Road (which intersects Rte. 90, five miles east of the 90/92 junction in Sierra Vista, Arizona). No charge for tailgaters. Talk-in on 146.52 or 146.16/.76. For more information, call Don Morgan W7ACI at (602)-458-5293, or write CARA, PO Box 1855, Sierra Vista AZ 86636.

CEDARBURG WI
MAY 2

The Ozaukee Radio Club, Inc., will sponsor its 8th annual Cedarburg Swapfest on May 2, from 8 a.m. to 1 p.m., at the Circle B Recreation Center, Highway 60 and County I, Cedarburg, Wisconsin (20 miles north of Milwaukee). Admission is $2 in advance, $3 at the door. Four-foot tables are $3 each. For admission tickets, table reservations, maps, or more information, send a business-sized SASE to 1987 ORC Swapfest, 101 E. Clay Street, Saukville WI 53080, or call (414)-284-3271.

BEMIDJI MN
MAY 2

The Bemidji ARC will hold its annual hamfest on May 2 at the Bemidji Middle School, beginning at 8 a.m. Exams will be given. Talk-in on 146.13/.73. For more information, contact Bemidji ARC, PO Box 524, Bemidji MN 56601; (218)-751-7920.

ROGERS AR
MAY 2

The Northwest Arkansas ARC will hold its 7th annual Hamfest on May 2, from 8 a.m. to 4 p.m., in the Rogers Youth Center, 315 West Olive Street, Rogers, Arkansas. Tables are available at no charge to commercial exhibitors or $2 each for others—first come, first served. Talk-in on .16/.76 or .03/.63. For more information, contact Roy Milliren AF5W, 2014 S. 16th Street, Rogers AR 72756; (501)-636-6750.

GREENVILLE SC
MAY 2–3

The Blue Ridge ARS will sponsor its 48th annual Greenville Hamfest and Electronics Flea Market on May 2 and 3 at the American Legion Fairgrounds in Greenville, South Carolina. Hours on Saturday are from 8 a.m. to 5 p.m., on Sunday from 8 a.m. to 3 p.m. Admission is $3.50 in advance and $5 at the gate. Walk-in amateur radio license exams given. For advance tickets or additional information, please send an SASE to Blue Ridge ARS, PO Box 6751, Greenville SC 29606.

IEEE TWO-WAY POLICE RADIO MILESTONE
MAY 2–3

The Bayonne, New Jersey, OEM ARC will operate W2ODV on May 2 and 3 from 1400–2100 UTC to commemorate the recognition of a national electrical engineering milestone by the IEEE for the first two-way police radio system. It was installed by the Bayonne, New Jersey, police department in 1933. Suggested frequencies: 3.870, 7.270, 14.270, 146.520, 144.830/145.430, and 222.680/224.280. For a certificate, send a QSL and a 39¢ SASE to W2ODV, Bayonne OEM ARC, 16th St. Firehouse, Bayonne NJ 07002. For further information, call Jerry Shiviskis N2EJQ at (201)-997-1151 or (201)-795-4543.

BATON ROUGE LA
MAY 2–3

The Baton Rouge ARC "Hamfest 50" and La. State Convention will be held on May 2 and 3 in the Gym Armory on the campus of Louisiana State University, Baton Rouge, Louisiana. Hours—Saturday, 8 a.m. to 3 p.m.; Sunday, 8 a.m. to 2 p.m. Free admission. VE exams to Extra both days at 9 a.m. Send SASE, 610, check for $4 payable to ARRL/VEC to George Perry W5LVX, 17424 Lady Constance, Greenwell Springs LA 70739. Talk-in on 146.19/.79. For more information, send an SASE to Rick Pourciau NV5A, 879 Castle Kirk Drive, Baton Rouge LA 70808.

DREXEL HILL PA
MAY 3

The Delaware County ARA will sponsor its 8th annual Hamfest on May 3 at the Drexel Hill Middle School, State Road and Penn Avenue, Drexel Hill, Pennsylvania (5 miles SW of Philadelphia). Doors open at 8 a.m. Admission $3. Indoor tables with electricity available by reservation at $3 per space. Outdoor tailgating on a first-come, first-served basis. Novice through Extra exams begin at 10 a.m. Talk-in on 147.96/.36, 224.5, and 146.52. For advanced registration and information, write to Hamfest, DCARA, PO Box 236, Springfield PA 19064, or call Barbara N3DLG at (215)-535-1616.

SULLIVAN IL
MAY 3

The Moultrie Amateur Radio Klub (MARK) hamfest will be held (new location-old location) at the Moultrie County 4-H Fairgrounds, Cadwell Road, five miles east of Sullivan, from 8 a.m. to 3 p.m. on May 3. No charge to vendors. Space on a first-come, first-served basis. Talk-in on .055/.655 and .52. Tests will be given for amateur licenses. For more information, write to MARK, PO Box 79, Sullivan IL 61951, or call Vernon E. Jack K9SWY at (217)-728-7596.

LONG ISLAND NY
MAY 3

The Suffolk County Radio Club Indoor-Outdoor Electronics Flea Market will be held on May 3 from 8 a.m. to 2 p.m. at Republic Lodge No. 1987, 585 Broadhollow Road (Rte. 110), Melville, Long Island, New York. General admission is $3 (wives and children under 12 free). Indoor tables are $10 each, and outdoor space is $7, including one free admission. Talk-in on 144.61/145.21 and 146.52. For additional information, call Bill Sullivan N2ETG at (516)-689-9871 in the evenings.

LYNCHBURG VA
MAY 3

The Lynchburg ARC, Inc., will hold its annual Swapfest on May 3, beginning at 9 a.m., on the grounds of Brookville High School, just outside of Lynchburg, Virginia, on Rte. 460 West. Admission is $1; tailgaters pay general admission, plus $2. Exams begin at 1 p.m., with limited walk-ins. Pre-register by sending a completed Form 610, copy of license, and check payable to ARRL/VEC to LARC Volunteer Exams, PO Box 201, Lynchburg VA 24502. More information can be obtained about the Swapfest by writing to the club at PO Box 4242, Lynchburg VA 24502.

STIRLING NJ
MAY 3

The Tri-County Radio Association will sponsor its annual Indoor Hamfest/Flea Market on May 3, from 9 a.m. to 3 p.m., in the Passaic Township Community Center in Stirling, New Jersey. Donations $3. Tables $8, with power $10. Limited reserved tailgating. Talk-in on 147.855/.255, 146.25, and 444.975/449.975. For more information, call Dick Franklin W2EUF at (201)-232-5955 or write PO Box 182, Westfield NJ 07090.

SANDWICH IL
MAY 3

The Kishwaukee ARC will sponsor the DeKalb Hamfest on May 3 at the Sandwich Fairgrounds on Suydam Road, just north of Rte. 34. Donation $2 in advance, $3 at the gate. Inside tables $5 each, outside selling space free. Talk-in on 146.52, 444.45, 146.13/.73. For tickets, write to KARC, Box 264, Sycamore IL 60178.

DEERFIELD NH
MAY 9

The Hosstraders (Joe K1RQG, Bob WtGWU, and Norman WA1IVB) will hold their Spring Tailgate Swapfest on May 9 at the Deerfield, New Hampshire, Fairgrounds. Admission is $2 per person, including sellers and commercial dealers. Profits benefit Shriners' Burns Hospital. Talk-in on 146.40/147.00. For a map or info, send an SASE to WA1IVB, RFD Box 57, West Baldwin ME 04091.

FLEMINGTON NJ
MAY 9

The Cherryville Repeater Association will hold its annual hamfest on May 9, from 8 a.m. to 4 p.m., at Hunterdon Central High School, Flemington, New Jersey. 200 indoor tables plus tailgating. FCC exams given. Talk-in on 146.52, 147.975/.375. For further information or reservations, call Bill Inkrote K2NJ at (201)-788-4080 or Don Mazak NR2H at (201)-782-1114.

FORT SHERIDAN 100TH
MAY 9

On May 9 from 0900 to 1600 local CDT (1400-2100 UTC), the Lake County, Illinois, Radio Amateur Civil Emergency Service (RACES), in cooperation with Troop #273 of the Northeast Illinois Council of the Boy Scouts of America, will be celebrating the U.S. Army's Fort Sheridan Centennial (1887–1987). Continuous operation will be in the low end of the 20m General phone band, on-the-hour operation in the new Novice/Tech. 10m phone band, and locally on 2m 146.550 phone and 145.010 packet. The callsign for the special-event station will be W9FUL. For a commemorative certificate, send QSL and 9 x 12 SASE (39¢) to the Lake County RACES, Inc., PO Box 624, Mundelein IL 60060. Deadline for certificates is July 4.

DANVILLE IL
MAY 9

The Vermilion County ARA, Inc., of Danville, Illinois, will hold an auction on May 9 at the Tilton 579 Civic Center, from 10 a.m. until 2 p.m. Free admission. Charge for auctioned items is 10% of $100 or less. Any items over $100, $10 flat fee. No charge if item is not sold. For further information, please contact Rod Pruitt WD9HXG or Clint Hartley N9EVT on the 146.22/.82 repeater in Danville, Illinois.

DULUTH MN
MAY 9

The Arrowhead ARC of the Duluth/Superior area will present Swapfest '87 on May 9, from 10 a.m. to 3 p.m., at the First United Methodist Church (the copper-domed church), located at 230 East Skyline Parkway in Duluth, Minnesota. Admission will be $4, with 4-foot tables going for $5. Amateur license exams will be held at 9 a.m. For more information, please contact Ron Carlson KØBR, 5128 Wyoming Street, Duluth MN 55804; (218)-525-6860. The contact person for the amateur exams is Eddy Lonnstrom N9DHG, 2026 Baxter Avenue, Superior WI 54880; (715)-392-2415.

HINDENBURG 50TH
MAY 9–10

The Jersey Shore ARS will operate W2DOR in Lakehurst, New Jersey, from 1700 UTC on May 9 to 1800 UTC on May 10, to commemorate the 50th anniversary of the crash of the airship Hindenburg. Frequencies will be around 3.875, 7.275, 14.375, 21.425, and 28.525 phone and 3.706 CW. A commemorative certificate will be available to U.S. stations for $1 and to DX stations for 3 IRCs. QSL to JSARS, PO Box 295, Toms River NJ 08754.

FREQ (kHz)	EMISSION	STATION	FREQ (kHz)	EMISSION	STATION
4001.5	LSB	NPG	10259.5	CW	NPG
4010.0	CW	NPG	13927.5	RTTY	NPG
4015.0	CW	NMH	13975.5	CW	NPG
4018.5	LSB	WAR	13986.5	RTTY	AIR
4021.5	LSB	AAE	13992.5	RTTY/CW	WAR
4025.0	LSB	AIR	13997.5	CW	AIR
6970.0	CW	NPG	14375.0	USB	NPG
6995.5	CW	AIR	14385.0	USB	NPL
6997.5	CW	WAR	14389.5	USB	NAV
7301.5	LSB	NPG	14400.0	Varied	NAM
7306.5	RTTY	AIR	14403.5	USB	WAR
7309.5	LSB	AAE	14408.0	USB	AIR
7315.0	LSB	AIR	14440.0	RTTY	NMH
7346.5	LSB	NMH	14480.0	USB	NZJ
7365.0	CW	NPG	20937.5	USB	NMH
7372.5	RTTY	NAV	20992.5	USB	AAE
7375.0	RTTY	NZJ	20994.5	USB	WAR
7382.5	RTTY	NPL	20998.5	CW	NPG
7393.0	Varied	NMN	21460.0	USB	NPG
9990.0	RTTY/CW	AAE			

Table 1. Frequencies on which the military stations will operate on Armed Forces Day.

BBQ FESTIVAL
MAY 9–10

The Owensboro ARC will operate K4HY from 0000 UTC on May 9 to 0530 UTC on May 10 to celebrate its International BBQ Festival. Frequencies: 7.245 phone and 10 meters phone. Certificate for SASE via N4EKG, 1615 East 23rd Street, Owensboro KY 42303.

MEDINA OH
MAY 10

The Medina 2 Meter Group, Inc., will sponsor the Medina County Hamfest on May 10, from 8 a.m. to 2 p.m., at the Medina County Community Center, 735 Lafayette Road, Medina, Ohio. Donations, $4 at the door, $3 in advance. Vendors' tables, $6 donation. Outdoor flea market: 10-foot space, $4 donation. Talk-in on 147.63/.03. For more information, send an SASE to Medina Hamfest Committee, PO Box 452, Medina OH 44258, or call (216)-769-3033 or (216)-725-4492 between 10 a.m. and 5 p.m.

BETHLEHEM CT 200TH
MAY 10+

The Hen House Gang ARC will celebrate the 200th birthday of Bethlehem, Connecticut, from May 10 on. Operation will take place on 10, 15, 20, and 40 meters and on Novice CW. Send one postage stamp only, no envelopes. For more information, contact W1FHP, the club president.

PRODUCTS INDUSTRIAL EXPO
MAY 14–16

The Tri-City ARC will operate special-event station W7VPA on May 14-16 from Pasco, Washington, in conjunction with Products Industrial Exposition '87. Daily operation from 1800–0200 UTC will be on 20- and 80-meter General phone bands. For a certificate, send QSL and SASE to TCARC, PO Box 73, Richland WA 99352.

BROKEN ARROW OK
MAY 15–17

The Broken Arrow and Tulsa ARCs will sponsor the 1987 Green Country Hamfest on May 15–17 at the Vo-Tech Southeast Campus, 4600 S. Olive, Broken Arrow, Oklahoma (111th St. S. and 129th E. Ave.). Entertainment Friday from 6–10 p.m. Flea market and dealer exhibits open from 9–5 on Saturday and from 9-1 on Sunday. Pre-registration is $4 each, maximum of $12 per household, or $5 each at the door. Flea market tables are $5 in advance or $7.50 at the door. For more information, call Ron Gamel N5WX at (918)-663-0385, or write Green Country Hamfest, PO Box 4970, Tulsa OK 74159.

NASHUA NH
MAY 15–17

The Northeast VHF Association will sponsor the 13th annual Eastern VHF/UHF Conference on May 15–17 at Rivier College, in Nashua, New Hampshire. To pre-register, send $14 to David Knight KA1DT, 15 Oakdale Avenue, Nashua NH 03062 before May 4. Registration at the door is $20. A special registration rate of $10 is available for any first-time attendee. In recognition of the new VHF/UHF privileges for Novice-class licensees, a special feature of this year's conference is half-price registration ($7) for Novices. Make all checks payable to Eastern VHF/UHF Conference. For more information, contact Lewis D. Collins W1GXT, Publicity Chairman, Eastern VHF/UHF/SHF Conference, 10 Marshall Terrace, Wayland MA 01778; (617)-358-2854 (6 to 10 p.m. EST).

ROCHESTER NY
MAY 15–17

The Rochester ARA will sponsor the Rochester Hamfest and Computer Show on May 15–17 at the Monroe County Fairgrounds, corner of East Henrietta Road (Rte. 15A) and Calkins Road, Rochester, New York. Show hours: Friday, outdoor flea market—12 noon; Saturday, indoor flea market—7 a.m. to 5:30 p.m., exhibit hall open—8:30 a.m. to 5:30 p.m.; Sunday, indoor flea market—7 a.m. to 2 p.m., exhibit hall open—9 a.m. to 1:30 p.m. Registration: $6 in advance, $7 at the gate, children under 12 admitted free. Outdoor flea market space, $5 plus registration. Indoor flea market table, $16 each in advance only, plus registration. Make checks payable to Rochester Hamfest and send to Rochester Hamfest—Tickets, 174 Croydon Road, Rochester NY 14610. Amateur exams on Saturday. Pre-registration is required and must be submitted no later than May 8. Send business-sized SASE to A. G. deBlieck KW2X, 59 Bay Knoll Road, Rochester NY 14622. Pay $4.35 on the day of the exam. Talk-in on 146.28/.88. For more information, contact Rochester ARA, Rochester Hamfest, 300 White Spruce Boulevard, Rochester NY 14623; (716)-424-7184.

WOONSOCKET RI
MAY 16

The RI Amateur FM Repeater Service, Inc., will hold its annual Spring Flea Market and Auction on May 16, from 12 noon to 5 p.m., at the American Legion Fairmount Post 85, 870 River Street, Woonsocket, Rhode Island. Admission is free. Spaces are $5 each. Talk-in on .34/.94 and .52. For further information, contact Rick Fairweather K1KYI, Box 591, Harrisville RI 02830; (401)-568-0566 from 7-9 p.m.

MICHIGAN'S 150TH
MAY 16

The St. Joseph County ARPSA will operate special-event stations on May 16 from 1200–2400 UTC from Centreville, Michigan, to celebrate Michigan's Sesquicentennial Birthday and to kick off Michigan Week. Members' stations and callsigns will be used. Frequencies: 3.930, 7.230, 14.250, 21.350, and 28.550. To receive a certificate, please send QSL and SASE to Lynn Norris KB8AET, 535 E. Main Street, Burr Oak MI 49030.

CADILLAC MI
MAY 16

The Wexaukee ARA will hold its 27th annual Swap and Shop on May 16, from 9 a.m. to 2 p.m., at the Wexford Civic Arena, at the junction of U.S. 131 and 13th St. Admission is $3. Talk-in on 146.97. For table reservations and more information, call John Craddock KX8Z at (616)-797-5491, or write the Wexaukee ARA, PO Box 163, Cadillac MI 49601.

GODFREY IL
MAY 16

The Lewis & Clark RC will sponsor its first annual Hamfest on May 16 at the Lewis & Clark Community College campus, Highway 67-111 in Godfrey, Illinois. No admission fee. Testing for all classes at 1 p.m. Talk-in on 145.230. For more information, call Harold KC9GL at (618)-466-1909, or write Lewis & Clark Radio Club, PO Box 553, Godfrey IL 62035.

COLORADO SPRINGS CO
MAY 16

The Pikes Peak Radio Amateur Association will hold its 1987 Swapfest on May 16, from 8:30 a.m. to 4 p.m., at the Rustic Hills Mall at Palmer Park and Academy Blvd. in Colorado Springs, Colorado. Admission is free. Table rental is $8 in advance or $10 at the door. VE testing on site. Talk-in on 146.37/.97. For information or reservations, call Al NØMW at (303)-473-1660, or write PPRAA Swapfest, PO Box 16521, Colorado Springs CO 80935.

ARMED FORCES DAY TEST
MAY 16–17

The 38th annual Armed Forces Day Communication Test will be conducted from 1300 UTC on May 16 to 0245 UTC on May 17. The traditional military-to-amateur crossband operation and broadcast of the Secretary of Defense message are the featured highlights and include operations in CW, SSB, and RTTY. Special commemorative QSLs will be awarded to verified contacts with any of the participating military radio stations. SWLs who receive and accurately copy the Armed Forces Day CW and/or RTTY message will receive a special commemorative certificate.

Participating Military Stations: AIR, 2045th Info. Systems Group, Andrews AFB, Washington DC; NAV, HQ Navy-Marine Corps, MARS Radio Station, Cheltenham MD; NPL, Naval Comm. Sta., San Diego CA; AAE, HF/MARS Radio Facility, Fort Sam Houston TX; NMH, Coast Guard Radio Sta., Alexandria VA; NZJ, Marine Corps Air Sta., El Toro CA; NMN, Coast Guard Comm. Sta., Portsmouth VA; WAR, HQ Army MARS Radio Sta., Fort Meade MD; NAM, Naval Comm. Area, Master Station LANT, Norfolk VA; NPG, Naval Comm. Sta., Stockton CA.

Military stations will transmit on the frequencies listed in Table 1 and will announce the specific amateur band frequency being monitored.

Receiving Test: A 10-minute tuning call will precede each transmission. The CW broadcast will be transmitted at 25 wpm beginning at 0300 UTC on May 17. The RTTY broadcast will begin at 0345 UTC on May 17

and will be transmitted at 60 wpm using 170-Hz shift.

Both broadcasts will be transmitted from the following stations on the listed frequencies: AAE, HF/MARS Radio Facility, Fort Sam Houston TX (4.0185, 6.9880, 9.9900); AAG, HF/MARS Radio Facility, Presidio of San Francisco CA (4.0215, 7.3095, 13.9945); AIR, 2045th Information Systems Group, Andrews Air Force Base, Washington DC (6.9955, 13.9975); NAM, Naval Communication Area, Master Station LANT, Norfolk VA (4.0050, 7.3930, 14.4000); NAV, HQ Navy-Marine Corps MARS Radio Station, Cheltenham MD (7.3725, 14.3895); NPG, Naval Communication Station, Stockton CA (4.0100, 7.3650, 13.9755); WAR, HQ Army MARS Radio Station, Fort Meade MD (4.0285, 6.9975, 14.4035).

Submission of Test Entries: Transcriptions of the CW and RTTY receiving tests should be submitted "as received." No attempt should be made to correct possible transmission errors. The time, frequency, and callsign of the military station copied, as well as the name, callsign, and address of the individual submitting the entry, must be indicated on the page containing the test message.

Entries must be postmarked no later than May 23 and submitted to the respective military commands as follows: AIR (Armed Forces Day Test, 2045ISG/DOJM, Andrews AFB DC 20331-6345); AAE, AAG, WAR (Armed Forces Day Test, Commander, USAISC, ATTN: AS-OPS-OA, Fort Huachuca AZ 85613-5000); NAM, NAV, NPG (Armed Forces Day Test, Naval Communication Unit, Washington DC 20397-5161).

W4ODR ARMED FORCES DAY
MAY 16

For the 5th consecutive year, station W4ODR, located northside aboard Naval Air Station Memphis, Millington, Tennessee, will operate in recognition of Armed Forces Day on May 16 from 1300–2300 UTC. Frequencies: SSB—7.230, 14.280, 21.370 ±10 kHz); CW—21.145, 28.145; 146.52. Special red, white, and blue certificates will be available to those who work "Whiskey Four Old Dusty Rebel." No SASE required! Calls not in the callbook should QSL to Military Club Station W4ODR, PO Box 54278, Naval Air Station, Memphis, Millington TN 38054, providing frequency and contact number. Requests for additional information on the Armed Forces Day events at W4ODR, NAS Memphis, should be directed to: Station Custodian—Senior Chief Petty Officer Bob Donan KA4FAL (901)-872-2007; Special Events NCO—Sergeant Major Jim Moffatt WD4SMW (901)-363-0778; or Military Club Station W4ODR/Navy-Marine Corps MARS Station NNN0NIF, Bldg. N-100, NAS Memphis; (901)-872-5134.

WA4USN ARMED FORCES DAY
MAY 16

The Charleston ARS will operate special-event station WA4USN on Armed Forces Day, May 16, from the deck of the aircraft carrier *USS Yorktown CV-10*, located in Charleston, South Carolina. Operation will be from 1000–2200 UTC on 29.350, 14.250, 7.250, and 3.850. Special QSL cards will be sent to all confirmed contacts sending an SASE to Special Event Station, 346 Parkdale Drive, Charleston SC 29407.

ABILENE TX
MAY 16–17

The Key City ARC will hold its annual "Fly-in/Drive-in Hamfest" on May 16 and 17 at the Abilene Municipal Airport, three miles south of I-20 on Loop 322, just east of town and across from the West Texas Fairgrounds. Talk-in on area repeaters. Registration begins at 8 a.m. For more information, contact Bill Jones N5DOX at (915)-698-4606 or W. K. Wiggins WB5ZOO at (915)-673-1332 (no collect calls, please).

BIRMINGHAM AL
MAY 16–17

The Birmingham ARC will sponsor its BirmingHamfest '87/Alabama ARRL State Convention on May 16 and 17, beginning at 9 a.m. both days, at the Boutwell Auditorium, 1930 8th Avenue North, Birmingham, Alabama. Admission is $4 per person, under 12 free when accompanied by an adult (admission is good for both days). Amateur license exams given. Talk-in on 146.880. For more information, call Dan Morgan KB4MDI, BirmingHamfest Chairman, at (205)-822-5242, or write BARC, PO Box 603, Birmingham AL 35201.

YAKIMA WA
MAY 16–17

The Yakima ARC will sponsor the Central Washington State Hamfest on May 16–17 at Central Washington State Fairgrounds, 10th Street and East Nob Hill Blvd. Hours: Saturday, 9–5; Sunday, doors open at 7 a.m. Admission $5 each. Pre-registration due by May 2. Lots of tables: No charge to display electronics-related items only. Contact W7AQ (Yakima ARC, PO Box 9211, Yakima WA 98909) to reserve a table. Consignment sales, limit 10 items, 10% of sale price. ARRL VE testing Saturday at 1:30 p.m. Talk-in on 146.25/.85.

PARAMUS NJ
MAY 17

The Bergen ARA will sponsor its Spring Hamfest on May 17, from 8 a.m. to 4 p.m., at Bergen Community College, 400 Paramus Road, Paramus, New Jersey. Sellers $5, buyers free. Tailgating only. Bring your own tables. Amateur license examinations. Talk-in on 146.19/.79 and .52. For more information, contact Jim KK2U, 444 Berkshire Road, Ridgewood NJ 07450; (201)-445-2855 nights only.

WRIGHTSTOWN PA
MAY 17

The Warminster ARC will sponsor its 13th annual Hamfest on May 17, beginning at 7 a.m., at the Middletown Grange Fairgrounds, located on Penns Park Road in Wrightstown, Pennsylvania. Donation is $3 per person (XYLs and children free). Indoor spaces with 8-foot tables and power available at $5 each (pre-registration only). Unlimited outdoor 8-foot spaces available at $5 each (no pre-registration). Talk-in on 147.69/.09 and 146.52. For information and registrations, contact Frank Charlton KA3FBP, 1479 Kingsley Drive, Warminster PA 18974; (215)-675-2549.

DALTON MA
MAY 17

The Northern Berkshire ARC will sponsor a flea market on May 17, starting at dawn, at the Dalton American Legion Field on Rte. 9, Dalton, Massachusetts. Admission is $1 per person. Women and children admitted free. There is no charge for selling space. For further information, call (413)-458-8452 (days) or (413)-458-8267 (evenings), or write to the Northern Berkshire ARC, PO Box 591, Williamstown MA 01267.

OLD WESTBURY NY
MAY 17

LIMARC will sponsor the ARRL Long Island Hamfair on May 17, beginning at 9 a.m., at the New York Institute of Technology, Rte. 25A/

Northern Blvd., Old Westbury, New York (Exit 39 North, Route 495, north on Glen Cove Road. 2 miles to 25A, turn right 1 mile to site). General admission, $3. All hams must buy a ticket; wives, children, and sweethearts free. Sellers' car space, $5; outdoor tailgating, no reservations needed. Talk-in on 146.25/.85. For further information, call Hank Wener WB2ALW at night at (516)-484-4322.

OLD BRIDGE NJ
MAY 17

The largest indoor computer and hamfest in central New Jersey, the OBRA annual festival will be held on May 17, beginning at 8 a.m., at Old Bridge Civic Center Arena, Cottrel Road and Highway 516, Old Bridge, New Jersey. (Easy access—Rte. 9 to Highway 516E, 3/4 mile to Civic Center.) Sellers: indoor $12, tailgating $8. Buyers $5 (save $1 if ticket is bought in advance). Table admits one. XYL, kids under 12 free. Exams given; pre-registration preferred. Walk-in registration at 9 a.m., testing at 10. Talk-in on 7.12/7.72. For more information or to make reservations (check payable to OBRA), contact Chris Mohr N2DHN, 50 Harrison Place, Parlin NJ 08859; (201)-727-1769.

ABEGWEIT AWARD DAY
MAY 17

The Prince Edward Island ARA will celebrate Abegweit Award Day on May 17 somewhere in the wilds of P.E.I., from 1200 UTC to approximately 0000 UTC. Modes: SSB and CW only. Recommended frequencies: CW—21.100, 14.050, 7.100, 3.700; SSB—21.300, 14.250, 7.200, 3.800. For more information and rules, contact Dave Smith VE1CIK, Box 529, Kensington, Prince Edward Island, C0B 1M0; (902)-836-4246 (after 2200 UTC).

KNOXVILLE IL
MAY 17

The Knox County RC, Inc., will hold its annual Knox County Hamfest on May 17, beginning at 7 a.m., at the Knox County Fairgrounds in Knoxville, Illinois. ARRL/VE testing will be given near the hamfest site. Talk-in on 147.00/146.40 and 146.52. For table reservations, pre-registration of testing, and advance tickets, contact Keith L. Watson WB9KHL, 119 South Cherry Street #3, Galesburg IL 61401-4527; (309)-342-3885 (evenings).

ATHENS OH
MAY 17

The Athens County ARA will hold its 8th annual Hamfest on May 17, from 8 a.m. to 3 p.m., at the City Recreation Center on East State Street. Admission will be $4 for each person attending. Indoor space is available by advanced registration only. (Contact Walt Jones N8DDL, 17 Berkley Drive, Athens OH 45701; 614-593-7871.) License examinations will be offered at all levels. (Mail completed Form 610 and a check for $4.35 payable to ARRL/VEC to John Cornwell NC8V, Exam Coordinator, 101 Coventry Lane, Athens OH 45701.) Talk-in on 146.34/.94. For general information, write to Carl J. Denbow KA8JXG, 63 Morris Avenue, Athens OH 45701.

WABASH IN
MAY 17

The Wabash County ARC will hold its 19th annual Hamfest, beginning at 5:30 a.m., on May 17 at the Wabash County 4-H Fairgrounds (State Road 13) in Wabash, Indiana. Donations are $4 at the door and $3.50 in advance. Advance reservations are requested. Inside tables are $10. Unlimited outdoor flea-market space. Amateur radio exams given. Talk-in on 147.63/.03, 146.52, and 146.94. For advance tickets or further information, contact Don Spangler W9HNO, 235 Southwood Drive, Wabash IN 46992; (219)-563-5564.

BLUEFIELD WV
MAY 17

The East River ARC, Inc., will hold the Bluefield Hamfest on May 17, from 9 a.m. until 3 p.m., at the Bluefield Recreation Center, 1/2 mile north of U.S. 460, near the Virginia/West Virginia state line. Walk-in exams at 9 a.m. ($4.25 fee for all exams except Novice) at Bluefield State College, Bluefield, West Virginia, in the first building on the right after entering the campus.

RANDOLPH OH
MAY 17

The Portage ARC will hold its annual Portage Hamfair on May 17, from 8 a.m. to 4 p.m., at the Portage County Fairgrounds, located on Rte. 44 between Interstate 76 and Rte. 224 in Randolph, Ohio. Tickets are $3 in advance and $3.50 at the gate. Inside display tables (with chair) are $8, and outside flea market space is $3 per space. Talk-in on 144.79/145.39. For table reservation and additional information, contact Joanne Solack KJ3O/8, 9971 Diagonal Road, Mantua OH 44255; (216)-274-8240.

CHICAGO IL
MAY 17

The Chicago ARC will hold its annual Mini-Hamfestation on May 17, from 9 a.m. to 3 p.m., at North Park Village, 5801 N. Pulaski, Chicago, Illinois. Admission $1. Half table $3, full table $5 (admits one seller). For info, call 545-3622.

KANKAKEE IL
MAY 17

The Kankakee Area Radio Society will sponsor the annual Kankakee Hamfest on May 17, from 8 a.m. to 4 p.m., at the Kankakee County Fairgrounds. Limited flea market tables. Admission $2.50 in advance, $3 at the door. Talk-in on 146.34/.94. More information from KARS, c/o Frank DalCanton KA9PWW, RR #1, Box 361, Chebanse IL 60922; (815)-932-6703 (after 5 p.m. CST) or (815)-937-2452 (before 5 p.m. CST).

PAGE DISTRICT WORKS HQ
MAY 17

The ham radio operators of Union Electric Co. will operate special-event station KA0AWS on May 17, from 1900–2400 UTC, to commemorate the many years of operation attained by the Page District Works Headquarters, which was opened in the 1920s and just closed in February, 1987. Frequencies will be 3.950, 7.230, and 14.235 ±QRM. For a special 8-1/2 x 11" certificate, send a 9 x 12" SASE (39¢ postage) with your log number to KA0AWS, 241 Tapestry Drive, St. Louis MO 63129.

SOUTHINGTON CT
MAY 17

The Southington ARA will hold its 4th annual Flea Market on May 17, from 9 a.m. to 2 p.m., at Southington National Guard Armory, 590 Woodruff Street, Southington, Connecticut. Admission is $2. Tables: $8 in advance, $10 at the door. Two persons admitted with each table purchased. Cut-off date for tables is May 11. All classes of exams will be given from 10 a.m. to 2 p.m. To pre-register, write to Vincent Calandra, 44 Matthews Street, Southington CT 06489. Talk-in on 146.28/.88 or 145.600. For further information, call Chet

KA1ILH at 628-9346 between 5 and 9 p.m. or send an SASE to Southington ARA, PO Box 873, Southington CT 06489.

TAYLOR MO
MAY 17

The Western Illinois ARC will hold its second annual Tri-State Swapfest on May 17 in conjunction with Fly-in-Breakfast sponsored by Chapter 488 of the Experimental Aircraft Association. The event will be held at Haerr Field, six miles west of Quincy, Illinois, in Taylor, Missouri (at the junction of Rtes. 61 and 24). General admission begins at 9 a.m. VEC exams for all license classes will be given. Talk-in on 147.03. For more information, write to The Western Illinois ARC, PO Box 3132, Quincy IL 62301.

SAMUEL MORSE DAY
MAY 23

The Bay Area ARS will operate special-event station KM3I on May 23, to commemorate the anniversary of Samuel Morse's first broadcast from Washington, DC, to Baltimore, Maryland. Operation will be CW on 40, 20, and 15 meters, 25 kHz up from the low end of the band, ±5 kHz. For a commemorative certificate, send log information and 8 x 10 SASE to BAARS, PO Box 805, Pasadena MD.

DURHAM NC
MAY 23

The Durham FM Association will hold its annual hamfest on May 23, from 8 a.m. until 4 p.m., at the lower rear deck of the South Square Mall in Durham, North Carolina. Tailgating is free. FCC exams given. Talk-in on 147.825/.225.

TUCKERTON WIRELESS TOWER 75TH
MAY 23-24

The Old Barney ARC of Southern Ocean County, New Jersey, and the Tuckerton Historical Society will sponsor the operation of special-event station KT2W, from 0001 UTC on May 23 through 2359 UTC on May 24, to commemorate the 75th anniversary of the start of construction of the Tuckerton Wireless Tower. Frequencies: CW—160-10, 50 kHz up in CW bands; phone—1.850, 3.890, 7.250, 14.280, 21.380, 28.480, 144.220, 146.52, local repeaters, and others. Special QSL via KT2W. Send SASE.

CARROLL COUNTY 150TH
MAY 23-24, 30-31

The Carroll County ARC will operate K3PZN from 1300-0100 UTC on May 23, 24, and 30, and from 1300-1900 UTC on May 31, in celebration of Carroll County's Sesquicentennial. Operation will occur in the lower 50 kHz of the General phone bands. For an 8-1/2 x 11 certificate, send QSL and SASE to Carroll County ARC, PO Box 2099, Westminster MD 21157.

WEST FRIENDSHIP MO
MAY 24

The Maryland FM Association will hold its annual Hamfest on May 24, from 8 a.m. to 3 p.m., at Howard County Fairgrounds, West Friendship, Maryland (I-70, 30 miles west of Baltimore). Donation $3. Inside tables by advance registration $7, at the door $10, if available. Talk-in on 146.16/.76, 222.16/223.76, or 449.1/444.1. For tables or information, contact Jim Clifford N3FBV, 7461 Terry Street, Ft. Meade MD 20755; (301)-674-4752.

QUEBEC
MAY 24

The Quebec Provincial Hamfest will be held on May 24, beginning at 9 a.m., at the Tracy Curling Club. Admission $4. Tables: outdoor $6, indoor $8. Limited quantity; please reserve before May 15. For more information, write to Sorel-Tracy ARC, PO Box 533, Sorel QC J3P 5N6 Canada.

GOLDEN GATE BRIDGE 50TH
MAY 24-25

The Marin County ARC will operate W6SG from 1500 UTC on May 24 until 0300 UTC on May 25 to commemorate the 50th anniversary of the Golden Gate Bridge. Suggested frequencies: CW—3.700, 7.100, 14.050, 21.100; phone—3.900, 7.250, 14.275, 21.350 ±QRM and interest. For a special QSL card, send an SASE (#10 business) with QSL card and contact number to MARC, PO Box 1231, San Rafael CA 94901.

CONSTITUTION 200TH
MAY 25

Amateur radio celebrates the bicentennial of the Constitution of the United States. Stations in Washington, D.C., and Philadelphia, Pennsylvania, will celebrate the meeting of the constitutional congress. Washington stations will be NN3SI (the Smithsonian Institute) and W3DOS (the Dept. of State). The Philadelphia station will be K3MTK. Stations will be on the air during the day and evening starting at 1500 UTC, somewhere in the lower third of the 20-, 40-, and 75-meter portions of the General bands. Other stations may join and will identify themselves as constitution stations. For Washington contacts, send a #10 SASE with your QSL card to NN3SI, Communications Exhibition, National Museum of American History, Smithsonian Institution, Washington DC 20560. For Philadelphia contacts, send them to WB2YEH, 7258 Walnut Avenue, Pennsauken NJ 08109. Write "Constitution" on the outside of your envelope in the lower left corner.

SIOUX CITY NE
MAY 29-31

The 3900 Club and the Sooland ARA are collaborating on Hamboree #9 to be held May 29-31 at the Marina Inn in south Sioux City, Nebraska. Several seminars will be featured. Convention admission is $5. For convention registration, write to Dick Pitner WØFZO, 2931 Pierce Street, Sioux City IA 51104. Flea market tables are $4 each. For table reservations, write to Al Smith WØPEX, 3529 Douglas Street, Sioux City IA 51104. Exams will be given Sunday morning at the Marina. Send $4.25 and your request for a Form 610 to WØFZO. Talk-in on .37/.97.

MIDLAND MI
MAY 30

The Central Michigan Amateur Repeater Association will sponsor its 13th annual Hamfest on May 30, from 8 a.m. until 1 p.m., at the Midland Community Center in Midland, Michigan. Admission is $4. Tables $8 and $4. Amateur radio license exams given. Talk-in on 147.00/.60. For more information, contact CMARA Hamfest, PO Box 67, Midland MI 48640 (please SASE); (517)-631-9228 (evenings and weekends).

SKANEATELES NY
MAY 30

The ARCS and Skaneateles Lions Club will sponsor the 1st Skaneateles Ham and Computer Fest on May 30, from 8 a.m. to 5 p.m., at Allyn Arena, Jordan and Austin Sts. in Skaneateles, New York, 25 miles west of Syracuse on U.S. Rte. 20. Admission is $2.50 in advance, $3 at the gate. Outdoor flea market is $2.50 in advance, $3 at the gate. Indoor flea market (8-foot table) is $8 in advance, $10 at the gate. Kids 12 and under free, if with attendee. Advance tickets by May 16. Walk-in VE license exams given ($4.35 payable to W5YI/VEC) at 11 a.m. Talk-in on 147.00/146.40 and 442.3. For reservations or more information, call Hank Bryant at (315)-685-7658, or write to Skaneateles Hamfest, 49 Elizabeth Street, Skaneateles NY 13152.

JEFFERSON DAVIS' B'DAY
MAY 30-31

The Confederate Signal Association of South Mississippi will operate a special-event station on May 30-31 to celebrate Jefferson Davis' birthday. Operation times will be 1800 UTC Saturday to 1900 UTC Sunday. The frequencies planned are 21.150, 21.350, 28.150, 28.350, 50.150, 144.150, and 432.150. QSL via W. R. Jeffrey KA4CRT, PO Box 923, Gulfport MS 39502-0923.

NEWINGTON CT
MAY 31

The Newington Amateur Radio League will hold its fourth annual flea market on May 31, from 9 a.m. to 2 p.m., at Newington High School, Willard Avenue (Rte. 173), Newington, Connecticut. Admission is $2 at the door. Indoor tables $8.50 ($10 after May 23), tailgating is $5. Amateur radio exams will be offered. Talk-in on 146.52, 144.85/145.45, or 223.24/224.84. For exam information or table reservations, contact Les Andrew KA1KRP, 23 Grove Street, West Hartford CT 06110; (203)-523-0453. Enclose an SASE for reply or confirmation.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

YARP

In honor of the month, "MAY" I tell you about a little item I just received? John Langner WB2OSZ of Chelmsford, Massachusetts, has written a "simple" RTTY program for the Atari ST. In a bit, you'll see why I put the word "simple" in quotes. Anyway, John notes that there is an Atari Microcomputer Network, which gets together on Sundays at 1600 UTC on 14.325 MHz (moved a tad for QRM if need be). This might be a good place to start if you are interested in putting an Atari on the air.

The program, called Yet Another RTTY Program (YARP), is far from "simple." Featuring both Murray (five-level) and ASCII operation; a split-screen display; a time and date status line; built-in CQ, RYRY, and Quick Brown Fox messages; editing; a type-ahead buffer; printer output; and the ability to transfer data to and from disk files, this program clearly classes with many other systems' full-featured programs.

YARP is set up to use an external terminal unit (demodulator, modem, or ___ [fill in your favorite term]). The serial port connector on the back of the ST is used (with standard pin assignments used) and the RTS line is used to key the transmitter.

The split screen I mentioned provides for an upper segment for received date, a status line across the middle, and a transmitted data segment across the bottom. On the very last line, a mini help line is provided. All input is through the keyboard, with the function keys serving to select various program options.

A copy of this program may be obtained by sending a blank diskette and $1 to the Atari Microcomputer Network, c/o John Adams KC5FW, 17106 Happy Hollow, San Antonio TX 78232. That's quite a bargain for a buck! Oh, by the way, John also tells me that the Network has a newsletter, information about which may be obtained from Gil Frederick VE4AG, 130 Maureen Street, Winnipeg MB R3K 1M2, Canada. Good luck, Atarians, and don't forget to mention RTTY Loop in your correspondence.

VHF/HF Packet Operation

A letter from Roger Owen WD8DJR points up one possible problem when you're trying to get a modern SSB transmitter onto RTTY. Roger details his problems with putting an AEA Pakratt (PK-64) onto RTTY with his Kenwood 530S.

Roger's first problem was a bum chip in the Pakratt, which apparently took quite a while to clear up between his local dealer and AEA. He finally retrieved his Pakratt, and although he says it works fine on VHF packet, he feels that it "isn't worth a 'hoot' when I try to copy RTTY signals on HF." According to Roger, his Pakratt does have the HF modem installed. He describes his 530S as with "all 'bells and whistles' and has a 500-Hz CW filter installed; no SSB filter, however." Well, Roger, that may just be the problem.

> ***"While operation on VHF vs. HF packet may look the same, the rf side of the picture is quite different."***

While operation on VHF vs. HF packet may look the same, the rf side of the picture is quite different. On VHF, the standard tones used follow the Bell 202 format, with tones at 1,200 Hz and 2,200 Hz. The center frequency, if you will, is 1,700 Hz and your radio must be able to pass the frequencies above and below the center, so as to pass the mark and space tones. On HF, however, Bell 103 tones are used, with a center frequency of about 2,125 Hz, and tone pairs of 2,025 Hz and 2,225 Hz. Now, your rig is equipped with a CW filter, which is set up to pass tones in the range of 450 to 950 Hz. You see the problem? You can't get the correct tones through that CW filter.

My suggestion would be either to invest in an SSB filter, which would pass the required tones, or to switch the CW filter out altogether and let the modem filter the audio for you. You have fine equipment there, Roger; you just have to remember the specifications of the signals you are dealing with. Please be sure to let us all know when you are "connected."

The AEA PK-232

R. George Newton, Jr., DDS WB2VUN of Skaneateles, New York, is looking for the best "black box" to hook his TS-430S to his Apple II Plus computer to get on RTTY. Best? Boy, have I dealt with that one before. Let me go out on a wire, though, and mention the AEA PK-232 this month. I am looking at one, and it is lovely!

I will try to tell you all more about it as I have fun with it; but for now, if suffices to say that if you can run a modem from your computer, you can run this one. And run it on on RTTY, CW, packet, and even AMTOR. It looks like the machine for all seasons. I don't know if it truly is the "best," but it certainly must be one of the finest.

Watch here for my future thoughts on this one. . . soon! In the meantime, look through the August, 1986, packet issue of *73*, and you might want to peruse the survey article in the March, 1987, issue of *QST*, which gives a capsule description of just about everything on the market. I would be interested in what you come up with. Be sure to let us know.

MODEM MGR

The Apple *//c* is one computer that I have seen more questions about than answers. John Rigsby NØFAC of Northglenn, Colorado, passes along his impression of one Apple communications program, MODEM MGR.

John says that MODEM MGR is a versatile program that can be used on Apple][+, *//c*, *//e*, or enhanced *//e* computers, under DOS 3.3 or ProDOS, and that it supports most serial and modem cards. An INSTALL program allows the preselection of options such as 80/40-column display, split screen, menu display, and control keys.

The net result of this is that once the program is configured, you can apparently boot and run it with a minimum of fiddling around. It supports disk transfer and XMODEM protocol for file transfers, and it has a full-featured screen editor, I am told. There also are user-defined macros that can hold station ID information, CQ, QBF, or the like.

John feels that the combination of the Apple *//c* and MODEM MGR, coupled with a good demodulator (he used the Theta-777), is excellent for getting onto RTTY, as well as landline communication. He does sound as though he's found a winner.

MODEM MGR is available from MGR Software (Suite 101, 305 So. State College Blvd., Anaheim CA 92806) for $49.99 plus $3 shipping and handling, according to the company. They do not advertise in amateur radio magazines, so if you do contact them, be sure to let them know that readers of *73*'s RTTY Loop are aware of their existence, and that advertising in *73* might not be a bad ideal

Hassle-free RTTY

Anyone who writes me on notepaper headed "TEXAS TURKEY" and punctuated by a picture of an armadillo at the bottom can't be all bad, so let me turn to a note I received from Paul Johnston KA5FVI of Austin, Texas. Paul is another ham looking to get onto RTTY "with as little hassle as possible. Do you have a free silver platter?"

I mention Paul's letter separately because he raises a common point. He says he feels no need for a computer, unless it might help him in this venture. And one of the things he especially would like to do is receive digital communications, on a variety of modes, and store them for later review. Well, I would say that a computer would be the best way to go!

There are several options. You could stay cheap, with a fully software-based system around a C-64 or CoCo, or you could use almost any computer capable of communicating with a modem and saving things to disk and interface through one of the more versatile RTTY-modems, such as the Pakratt mentioned above or the Kantronics KAM or UTU.

My own bias is to get the best you can afford. If you want to get your feet wet, go ahead and wander around the bands with a software system; many have been mentioned here in the past. But when you want to get serious, I suspect that you'll want to go for a full-featured modulator/demodulator that can support all the modes you will want to cover.

You may do well to read that review article, too, and be sure to let us all hear from you as to how you make out.

Info Needed

Turning to harder topics, Robert G. Unger WB3DTB of Nazareth, Pennsylvania, needs some information about a Teletype® Model 32 he is working on. Bob wants to hook up the 32 via the terminal strip in the back and needs the pinouts. I've got to beg off on this one. I don't have any documentation for the Model 32. Certainly some of our readers do, though, and I will be happy to pass along the information to Bob—and to the rest of the gang if one or more of you would send it to me. OK? Thanks.

Increasing HD-3030 Sensitivity

An old friend, John Davison WØZFN of Kirkwood, Missouri, dropped me a line the other day. An old 6800 buddy, he has just obtained a Heathkit HD-3030 (which he says is really a Flesher 470 in disguise) and has a problem. John says that a 100-mW signal is required to saturate the limiter, so that signals buried in the noise just don't hack it. He asks if there is any way to increase the sensitivity of the unit.

Well, John, the obvious answer is to put an audio preamp between the receiver and terminal unit, but I don't think that is a realistic answer because you will end up with as much noise as signal. I don't know what kind of receiver you are using, but filtering may be the answer you are looking for.

Ideally, you should have a bandpass large enough to accommodate the signal you are receiving, and no larger. This will clearly change from CW to various RTTY or packet modes; one filter, which may be perfect for one mode, just will not do it all. Typically, if you are using too wide a filter, you will be including all kinds of extraneous junk, which will serve only to damp down the signal you are looking for. Conversely, if you are using too narrow of a filter, one of the tones you need, or both, may be outside of the filter and be attenuated.

Although I wrote Heathkit about the HD-3030, they were unwilling to part with any information. I have not heard much from readers either on the unit. Why? Readers?

All For Now

You are a vocal lot, RTTYers, and, as always, I enjoy your letters and questions. Those of you who have sent me E-mail via CompuServe or Delphi have found responses in your mailboxes within days—sometimes hours. Letters take a bit longer, but I think I am finally caught up.

If you have sent me a letter and more than a month has gone by, there is a good chance that either it has gone astray or it has somehow insinuated itself into one of the piles of papers in my office. At any rate, please feel free to ring my chimes with a reminder.

As one of you wrote, though, "I guess the reason no response has appeared in my mailbox is that I have not sent an SASE, right?" Right. With the amount of mail I receive, I do appreciate the consideration, as do most authors, of your including a self-addressed, stamped envelope with any letter you wish me to answer personally. Of course, letters of general interest will continue to find their way into this column, SASE or not.

The reprint list is alive and well, with a sheet detailing what's available for an SASE to the above address. I hope to have some new wrinkles in the list by summer. You might drag your feet sending a request until then, unless you really are looking for something now.

Whether written, via USPS to the above address, or by E-mail via CompuServe (75036,2501) or Delphi (MARCWA3AJR), I do enjoy your letters, questions, and comments. I hope to have a few real fireballs for you over the summer, just the thing to light up the skies, courtesy of RTTY Loop.■

NK6K > PACKET

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THE YEAR IN REVIEW

Well, here it is, my first year's anniversary writing a column for *73* Magazine. Things have worked out pretty much as I thought they would. I promised Perry Donham that the only column that would be on time was the first one, and that's been true ['tis true—eds.]. I still don't agree with everything Wayne says. And one prediction that didn't take much smarts—packet is still growing. We've shared 148,410 bytes of NK6K > Packet (before editing) in 11 columns (there was no packet column in the August gala packet issue). Your input is solicited.

In the May 86 column, written in February 86, I included a capsule history of amateur packet development up to that time. Most of the work mentioned as under development is either completed or continuing. The TCP/IP software development in New Jersey has expanded to other areas of the country. The Texas software (TEXNET) is up and running. There are now an estimated 30,000 TNCs in the world.

1986 was the year that multimode TNCs hit it big, and a 2400-baud TNC didn't. It was also a year when the hoped-for commercial 9.6K and 19.2K modems didn't appear. Rumors indicate that high-speed modems will be on display at Dayton this year. Let's hope so. The JAS-1 spacecraft was launched in 1986; Phase 3C was delayed until 1987.

PACKET APPLICATIONS

I'm always interested in what people are doing with packet. Placing applications on the network is as interesting as building the network itself. A couple of interesting things have popped up in California recently. If there are any interesting packet applications in your area, write in or send me a packet message at NK6K @ NK6K.

Weather

The first interesting application I'll discuss this month is the weather node run by Bill Hutchins KB6CYS in Cypress, California. There are other weather-reporting systems connected to TNCs around the country, but to my knowledge, Bill is the only ham doing his own predictions and making them available along with the report on current conditions.

For those who don't have a local weather node, when you connect to one, you get a report of local weather conditions. When you connect to KB6CYS, you get a report on several weather parameters, plus a few lines of text giving Bill's prediction of the weather for the next 24 hours. Bill forecasts twice a day as time permits. His description of his system follows:

"The system consists of two Apple *//e* computers, a TNC-1 with DED firmware, and a Heathkit ID-4001 weather computer with a custom interface card to latch data for a four-port parallel interface in the Apple. One of the Apples runs a data acquisition program written in Basic that reads the data from the weather computer and stores the information as variables. This info is displayed on the monitor and is also held for output to the TNC.

"The info sent to the TNC when someone connects consists of wind speed and direction, temperature, dew point, barometric pressure, rate of change and rise/fall of pressure, maximum and minimum temperatures, total rainfall since midnight, and total rainfall for the month. I also have displayed locally the average wind direction over past hour, peak wind gust speed and time, wind chill, and rainfall start and stop times.

"A local forecast is also provided upon connect. The forecast is based mostly on the National Weather Service forecast, although I tend to deviate occasionally from theirs based on what I've seen happen in this area along with the info from the weather computer. I have caught several storms so far this year that the NWS did not forecast. I also 'blow it' occasionally when I deviate.

"I try to change the forecast twice daily when my time permits. Other neat gimmicks are in the works for this system, such as weather-related files, weather history, conversion charts, etc."

Because Bill is forecasting for his immediate (small) area, he is sometimes able to best the professional forecast, which is usually reporting on averaged conditions for a much larger area. An amateur network of weather stations could prove useful for VHF propagation predictions, especially in our coastal region where ducting is common.

White Pages

The second application this month is the "white pages" program written by Eric Williams WD6CMU in El Cerrito CA. His documentation describes it best:

"WP stands for 'white pages'

and is a directory system for packet radio mailboxes. It allows remote query and updating of a database that lists the users of RLI-compatible mailboxes and their home BBS. To use the program, a message is sent to 'WP' at WD6CMU. The message can have several lines (a single message can contain several queries and updates), but each line must have one of the following formats:

<callsign> QTH?
<callsign> QTH <mailbox>
DE <callsign> @ <mailbox>

"The first form is a query and will return the home BBS of the person with the given callsign. The second form adds or changes the entry for the given callsign, storing his home mailbox with his callsign. The third form provides a return address for the requested information. If the message does not contain a line of the third form, the WP program will try to get the return address from the forwarding headers. This will work as long as the mailboxes in the forward path use the [@:call] format for forwarding headers.

"Replies will be sent to the originating station at the mailbox specified as described above. The reply will be generated a few minutes after the message is received at WD6CMU. Currently, the WP program is run every 15 minutes, so that is the maximum wait for a reply. Of course, queries sent from other mailboxes will have to make their way through the forwarding system, as will the reply."

Like several other lists of users, it is only useful if a large number of users are listed. If you have a similar system in your area or if someone is maintaining a list and distributing it, I hope you'll add your name and home BBS.

HEADER WARS

In the February column, I reported on the header wars. Headers are lines that each forwarding BBS adds to the front of a message as it is passed through that station. Headers can be useful, as shown by the WP program discussed above. In that example, the program can automatically return a message to the originator. The scheme works only if the header is a standard format.

Picking the standard format is what the header wars are all about. The war has cooled down a bit; almost everyone is tired of discussing the topic.

One of the last proposals to be made was a scheme that would make it possible to have almost any piece of information (lat/long, area code, etc.) present in the header while maintaining readability. The format was not order-dependent, so that the local sysop could have items in any order he wanted (see Fig. 1).

```
R:870312/0648  @:WB6KAJ Brea, So. Calif. #: 4341 O:KR5S  F:145.36/14.109
R:870311/1905z @:WD9DHI Cedarburg, WI #:3604 O:KR5S F:14.109/145.09
R:870309/0657  @:W1HAB Boulder, Co. #:2028 O: KR5S
R:870309/0853z @:W3IWI Balto/Wash #:9986 O:KR5S  F:14.109/221.01
R:870309/0628z @:W3IWI Balto/Wash #:947 O:KR5S F:145.05/221.01/145.01
R:870306/1746z @:WB7DCH Enumclaw, WA G:CN97 #:113 O:KR5S
R:870306/1643z @:W9ZRX *** IndyGate *** #:17452
R:870306/1641z @:KR5S Sedona, Az. #:4873  O:KR5S   F:145.01/14.109
```

Fig. 1. Headers in the latest proposed standard format.

Much of the western and midwestern U.S., Canada, and part of the East Coast have switched to that format. All of California has switched, making more programs like WP possible.

I won't bore you with the details here; the format is on CompuServe's HAMNET forum, and it has made the rounds through the forwarding BBS system. It is called the VE3GYQ/W3IWI/WB6KAJ/NK6K/WB6YMH proposal. WØRLI reported at the recent TAPR meeting that he and WA7MBL had agreed on using that format in their BBS software and will hard-code the order of the first few fields.

The WB6YMH BBS takes advantage of the standard header format in a different way. A user-selectable option causes messages to be displayed with all of the headers stripped out, except for the header from the originating station. This allows BBS sysops to manage and gather statistics on the network, while not showering the user with unwanted bytes.

TAPR MEETING

The 1987 general membership meeting of Tucson Amateur Packet Radio was held in late February in Tucson, Arizona. If you are new to packet, you may not know about TAPR.

In 1983, TAPR, a nonprofit R&D club, came out with a kit-based terminal node controller that could easily be assembled and put on the air. Included were all of the hardware, software, and documentation needed, and it was the first all-in-one package. TAPR sold the rights to manufacture TNCs using this design—including the negatives of the circuit board and silk screen, the machine-readable source code, and the manual—to all comers for $500.

The first AEA TNCs used the entire design. The first Kantronics TNCs used the software. TAPR was able to prove, with the 2,500 kits that it made and sold, that there was sufficient interest in packet radio in the amateur community to justify the expenditure of cash by mainstream amateur manufacturers. From that "guaranteed market" base has come the new R&D we've seen from sources other than TAPR.

TAPR also standardized a user interface. Though more suited for human users than for computer-to-computer interface, the TAPR command set provided "interoperability" across manufacturers' products. That made it possible to develop standard BBS software and resulted in the WØRLI message-forwarding system.

Even hardware that was not derived from TAPR hardware maintained compatibility with the old standard. Such hardware (for example, the AEA PK-232) is now providing a bridge between the old 1983 standards and future standards. The newer PK-232 ROMs contain a new computer-to-computer interface suitable for use with the TCP/IP network software. TAPR's goal of seeding the market and getting things started has been met.

Although TAPR "gave away" rights to the TNC-1, they (or I should say we since I'm a member) sold the rights to their next effort, the TNC-2, on a different basis. The rights to the TNC-2—on which the MFJ-1270, the GLB TNC2, the AEA PK-80, the PAC-COM TNC-200, and others are based—were sold for $5,000 plus royalties of $5 to $3 per unit on a sliding scale. This was done for two reasons. One was to pay off the debt accumulated during the TNC-1 days—TNC-1s were sold at cost; the cabinets were sold below cost. The other was to raise money for future development.

TAPR is actively seeking new projects to support with this money. We're primarily interested in things that the large manufacturers would not be, important things with limited demand, things for which a large guaranteed market does not (yet) exist.

TAPR pays for tools and supplies, and reimburses communications and travel costs; it does not pay salaries. The only TAPR person paid for labor is the woman who answers the phones and picks up the mail. TAPR also pays for packaging and distribution of kits—for example, the K9NG 9600-baud modem.

TAPR can get involved a little or a lot, depending on the desires of those involved. On one end of the scale is a TAPR project like the PSK modem. Spearheaded by Tom Clark W3IWI, the PSK modem, suitable for use with JAS-1 and terrestrial work, was done entirely under TAPR's auspices. All development hardware was paid for by TAPR, and the product will be kitted and distributed under TAPR's name.

On the other end of the scale is the WØRLI/VE3GYQ/et al BBS project. TAPR assisted in that project by paying more than $1,000 in communications cost between the developers. But TAPR's name doesn't appear on top, just down somewhere in the credits. TAPR had no more say than anyone else in the direction the project took.

TAPR is looking for similar ways to help turn a little money and hard work into benefit for the packet community at large. If you have a hot project, but it's on the back burner because you can't afford (or find) a particular part, or you have one done and would like help documenting and distributing it worldwide, contact TAPR at PO Box 22888, Tucson AZ 85734.

The TAPR meetings usually attract the leading edge of packet developers. Among those present were WØRLI of BBS fame, KA9Q of TCP/IP fame, and W6IXU of NETROM fame.

An interesting non-human attendee was the world's smallest TNC-2. Built by the Packet Radio User's Group club in Japan, it consisted of two boards, each two inches by three inches. The

boards were four-layer and were built using surface-mount technology. The board was all CMOS and included all the elements of a standard TNC-2. The TNC-2 software ROM was in a surface-mount socket. The boards mounted less than 1" apart. I have little doubt that you could take the electronics from one of the shirt-pocket HTs and place it and the PRUG TNC-2 in a standard HT volume.

Also present was the world's most expensive TNC-2—the "Tempest" TNC, being shown by Al Danis K6HGF from Hadron, Inc. Tempest is a government standard for shielding a device like a computer so that rf generated by the computer is not radiated. This is not for TVI protection, but rather to keep the data from being "broadcast" and detected by the bad guys.

This shielding, and the cost of getting the shielding certified, is expensive. The Tempest TNC, with its forward error correction feature and its suitability for connection to an external encryption device, sells for $5,000. Compared to other similar devices, this is cheap.

Their TNC has been on Air Force One and has been used for White House communications. It has been used in other high-level government applications; about 200 are already in the field.

The major features of the TNC-2 that make it useful in this application are the automatic retry of unacknowledged data and format of the transmitted data. A side effect of the way we send data is that asynchronous (start/stop mode) data from a terminal is translated into a continuous bit-synchronous data stream. The synchronous data is more suitable for certain types of data-encryption devices.

Al pointed out that here was an example of a project in which as much as $1 million in development costs had been saved by using technology that amateur radio operators had developed. Several of the audience members expressed a wish that this information would find its way to the FCC for the 220 docket.

A FEW STATS

As usual, I'm out of space but have more to say. WB6YMH and I are working on a statistics-gathering system for packet in our area. A preliminary run showed that 2.6 million characters were sent on 145.36 in the LA area during the 24-hour period ending Sunday morning 3/8/87. Not counting transmitter key-up delay (i.e., just the character transmission time), that's 299 minutes used, or about 20% channel utilization. Packets were heard from 81 different stations—145.36 is a BBS frequency.

On 145.01, during the following 24 hours, 1.3 million characters were heard from 196 stations. This is not as predominantly BBS as 145.36.

There are eight frequencies in active use in this area. We're going to gather stats on all of them. More on this topic next month.■

FUN!

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PIRACY ON THE HERTZIAN WAVES

Well, yo-ho-ho. Shiver me timbers and avast ye transmissions, matey! 'Tis time to talk about a subject near and dear to all hams' hearts—radio piracy.

Who among us has not, at one point or another, contemplated the pleasures of running an illicit radio station? Who among us has never "accidentally" slipped his vfo into a subband reserved for the exclusive use of higher-class licensees? Who among us can look into the mirror each and every morning, with a face covered by Gillette Foamy, and say, "I am truly an honest and law-abiding ham"? Judging from the people I know, not very many.

Radio bootlegging and piracy (there's a subtle difference between these two arts, but don't ask me to explain it) are the deep and dirty little secrets of our hobby. Most hams are like the minister who preaches sobriety from the pulpit, but sips glasses of sherry in the study. "Kill those damn bootleggers," shout the pious, who then go and dabble in some foreign territory DX. Yum!

I think piracy and bootlegging are especially rampant among our callow youth, what's left of 'em. Kids, not seeing any sense in learning that silly binary code we force down the throats of potential inductees, prefer the easy way out and award themselves their own tickets. And with the FCC and ARRL being what they are these days (shambles?), they know the chances of being caught are exceedingly slim.

Now, don't get me wrong. I'm not endorsing any of this; nor am I waving a disapproving finger. Being a fair-minded journalist, I'm merely pointing out that such activity exists, and these days probably in unprecedented numbers.

"Who among us can look into the mirror each and every morning, with a face covered by Gillette Foamy, and say, 'I am truly an honest and law-abiding ham'?"

Actually, some of my best friends have been bootleggers. For instance, back in the late 70s, I knew Tom, a computer science major at a leading Long Island university. Tom, like most radio pirates, had a bit of an ego problem in that he loved the sound of his own voice more than anything else in the world. His school had a campus FM station, but Tom preferred running his own show. He never much bothered with the crowd that congregated at the school's station, for Tom had what was probably the most foolproof scheme ever devised for running a bootleg station.

Broadcast bootleggers face a strange paradox. On the one hand, they want their signals to be heard far and wide. The more attention they gather, the better. On the other hand, they don't want to attract so much attention that they invite a visit from the guys in the truck with the funny antennas. And therein existed the beauty of Tom's scheme.

"The idea is to go on the air only during raging snowstorms," Tom told me at the time. "That way, the FCC isn't going to be able to track you down. No four-wheel drive for the candy company, right? Besides, the rotten weather gives you a captive audience." Tom was a broadcasting genius.

So, two or three times every winter, WONS ("snow" spelled backwards) would hit the stormy air. And it was a fine station. Great classic rock mixed in with snappy chatter, frequent time checks, and well-prepared news reports were WONS trademarks. Heck, the station even provided weather and traffic reports for those stuck in the elements.

Unlike most bootleg operators, Tom was smart enough not to wear out his welcome. WONS remained on the air only as long as the flakes were falling, and the entire operation was disbanded after a few winters. "I grew up," the pirate's pirate told me recently. Grown up, but certainly not forgotten.

Unfortunately, as far as radio pirates go, Tom was a rare and intelligent exception. Most bootleg stations I've heard recently are of an astonishingly poor caliber. Lousy music, lousy talk, and lousy signal quality are hallmarks of the pirate stations of the 80s.

What on earth has happened to the broadcast pirate? Drugs? Booze? Heavy metal? Morse code? Darned if I know. The main problem is that these newcomers are committing the pirate's most unpardonable sin—they're boring.

The ham radio pirate scene isn't much brighter. Pirates on our own bands consist primarily of Colombian drug traders, wealthy sea-going air-heads, and those famous South American Bible traffickers ("The psalms are on the way, Jose!"). On the whole, a pretty sordid lot.

I think it's up to the FCC and ARRL to clean up this mess. It's time we urged the mighty powers in Washington and Newington to get us a better class of pirates. Perhaps we could ask the Feds to set aside a portion of one of our more useless bands (20 meters?) for the exclusive use of bootleggers. Direct competition may be just the ticket to improve the quality of these stations.

On the other hand, maybe we should just ship 'em all to Siberia, a place with lots of WONS.■

DX

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ALMOST ATHOS

In August of last year, four Italian DXers failed in their attempt to stage a major DXpedition from Mt. Athos. Thanks to Tony Privitera I0IJ for furnishing the information for this report. Mount Athos SV/A lies at the tip of a rocky peninsula in northeastern Greece. More than a thousand monks live on the Holy Mountain, with little electricity and with only donkeys for transportation. The town can be reached only by ferry boat. Women, long hair, musical instruments, smoking, dogs, whistling, and movie cameras are prohibited. The country has been very rare on the ham bands in recent years, due to the reluctance of the monks to issue permission for visiting amateurs. What few operations have made contacts from Mt. Athos have been surrounded by controversy. The latest attempt to activate Mt. Athos was no exception.

Propagation Study

The Italian "Almost Athos" DXpedition began with a proposal from Prof. Meo Furino I0ER to the University of Palermo to do a study of ionospheric propagation. His idea was to make a bunch of radio contacts at the bottom of the sunspot cycle in order to map changes in the ionosphere. Meo and other Italian amateurs proposed that the investigation be conducted from a spot remote from sources of man-made electrical interference, a spot surrounded by water, and one not too near the tropics. "After careful examination and evaluation, we have reached the conclusion that only the Halkidiki Peninsula, at its extremity of Mount Athos, can guarantee good statistical data," the proposal read!

Although labeled a "scientific expedition," the group's proposal specifically mentioned operation on amateur frequencies from 160 meters through 432 MHz, and "exchange of radio signal strengths and levels of comprehension." In other words, a signal report. There was no question that this was a DXpedition, although that word does not appear in the proposal. The proposal also suggests operation from the top of the mountain, 7 km from the nearest monastery, to avoid disturbing the "spirituality and the ascetic life" of the monks.

The group's proposal won favor with the University of Palermo. And, with the official backing of the university, the Italian amateurs started assembling the necessary permits from Greece and Mt. Athos.

The Greek Ministry of Transport and Telecommunications issued a temporary permit to operate a radio amateur station to I0ER, I0DUD, I0GPY, and I0IJ. Then on July 1, 1986, the Ministry of Foreign Affairs granted permission for the operation. The only remaining stumbling block was the written permission from the Holy Community that runs Mt. Athos. The monks had always been very reluctant to issue such permission, and more than one prominent DXer walked away from Mt. Athos without written authorization from the monks.

The Monks Agree

This much-coveted document finally arrived on July 29 (only two weeks before the planned starting date). The Holy Synod authorized "entry into Mt. Athos with your vehicle, to utilize the agreed frequencies." [All frequencies listed were amateur allocations.] They had it! Written permission to conduct a DXpedition on Mt. Athos! The last hurdle surmounted, the DXpedition was on. Or so they thought.

While waiting for official permission from the Greek authorities, Meo invited a Greek Mt. Athos DXpedition veteran to join the trip. Manos SV1IW had operated /SV/A in 1980–81, but this time he balked at the 1/8 share of the costs he was asked to provide. As a final courtesy to the local amateurs, Meo wrote to the president of the Greek amateur radio society, the RAAG, describing the operation. Meo sent this letter on the same day he got the final permission from the monks, so he made an honest effort to keep the Greeks informed.

With time running short, the Italians started packing their van with more than 3,500 pounds of gear, including camping equipment and food, nine transceivers and their linears, monobanders and crank-up towers, wire, and three electrical generators.

The Greeks Intervene

Within a matter of days, the months of careful preparations began to unravel. The local Greek amateurs, still hot under the collar about the disputed Mt. Athos operation by Frank Turek DK7FT earlier in the year, felt that the Italians obtained their Mt. Athos operating permission by fraudulent means. Almost as soon as the Greeks received Meo's letter explaining the Italians' plans, RAAG members were arguing in front of government officials that the Italians were out for pecuniary gain and personal glory, and not scientific progress.

The tactic worked, and on August 4, only three days before the team was scheduled to drive to Mt. Athos, the Italian Embassy in Athens received an official note prohibiting all radio "emissions" from Mt. Athos, and specifically those on any amateur frequency.

The reason given for the revocation of the previously granted permission was concern that the operation should be for "the progress of Science and the good of Humanity and not for a profit or personal interest."

Pino I0DUD immediately flew to Athens to try to mend the broken fences and regain their hard-won permission. Through the help of the Italian Embassy, he was able to meet some low-level officials, and based upon this progress, the rest of the team left Rome on August 8.

Pino's efforts to reach decision-level officials failed, however, and the Ministry of Transport and Telecommunications modified the Italians' operating permit to specifically exclude Mt. Athos. "Activity from Mt. Athos must be limited only by listening to radio messages." The Ministry further restricted the Italian license by stating that representatives of RAAG be present at all amateur operations.

The van with all the equipment arrived after its long drive and ferry trip, and the Italians elected to set up their station near Ouranopolis, only 3/4 mile from the Mt. Athos border (see Photo B). I0IJ/SV made a few contacts from this spot, but eventually the operation ceased, and the crew headed back to Italy, having spent more than $12,000 in their unsuc-

Photo A. Tony I0IJ operating /SV only 3/4 mile from Mt. Athos (photo by I0ER).

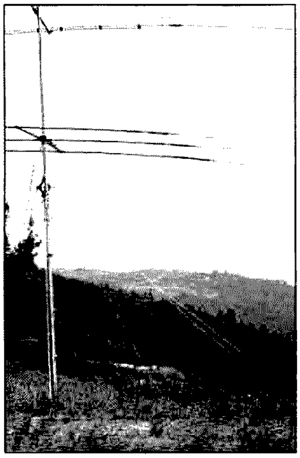

Photo B. A tribander and a 2-element, 40-meter beam look out over Mt. Athos SV/A (photo by I0ER).

cessful attempt to activate Mt. Athos.

Interestingly, the Italians did visit Mt. Athos, but without their radios. Along with unfruitful attempts to get permission to operate, the Italians used the opportunity to check the Mt. Athos files. They were looking for the file copy of the permission Manos SV1IW received when he operated from Mt. Athos. Msgr. Damaskinos, General Secretary of the Holy Epistasy, stated that Manos' permission was a fake, and there was no file with such a serial number!

This could mean that the Mt. Athos filing system leaves something to be desired or that one of the few accredited operations from Mt. Athos was, in fact, illegal. Further, the monks suggested that they thought radio amateurs were a constant source of irritation into their quiet lives, and that the hams were in it for the money. The latter was based on numerous missent QSLs, many containing Green Stamps (U.S. $1 bill).

This latest episode will not encourage the monks to grant amateur radio permission soon. The obvious infighting among the hams and the accusations of financial gain backed up by the missent QSLs provide powerful incentives to continue to prohibit amateur radio operation on Mt. Athos. The Greeks have dealt a death blow to their own chances of operating from Athos with this attack on the Italian DXpedition.

There is one ray of hope, however. A resident monk has been taking a 60-mile ferry ride each week to study for his amateur radio license. Unfortunately, the monk did not show up for the test last fall; maybe he'll try again this spring. Even if he gets his license, however, he will still need permission from the Holy Community to operate from Athos. Only time will tell. ■

QRP

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THE 6L6 SPECIAL

Since I started doing this column in October, many of you have asked for small projects to build. This time I have a real treat for all the readers who like the smell of molten solder. But before I get things started, I'll give you some history. The project this month is a little rig I call the "6L6 Special." In a past column I made mention that I use a small 6L6 transmitter from time to time. Well, there was quite a bit of interest in my little rig. So much, in fact, that I got tired of running down to the quick print shop for copies of the schematic.

A Bit of History

Now for the history lesson. Looking back to 1986, there was one small anniversary that went unnoticed to most of the world. The 6L6 turned 50 years old.

As years go, 1936 was a lot better than most. The electronics world was just starting to cook. The country was slowly coming out of the Great Depression. General Electric Company, in 1935, developed the idea of a metal receiving tube. RCA was licensed to produce these tubes for the home market.

At the same time, RCA was busy working on a revolutionary tube design that would offer high power, high gain, and low signal distortion—with lots of output power. Between RCA and General Electric, it seemed natural to incorporate this new concept in the newly developed metal envelope. After the smoke cleared, the 6L6 was born in the spring of 1936.

The tube was designed for audio use, but it could crank out more than 35 Watts of power when used as a crystal oscillator. However, the metal tube was not the answer to the world's troubles. Seemed no one really knew what to do with the metal envelope—leave it float or ground it. Later on, RCA redesigned the tube, using a glass envelope. This glass tube was named 6L6G. Then RCA moved the plate connection to the top of the tube and the 807 was born.

The 807 was a real rock-crusher. Running an 807 with 600 volts on the plate could turn out 60 Watts input all day long. But the days of the 807 were numbered; it was to be replaced by the 6146. However, the 6L6 was given a new life in the world of television as the 6LQ6, a horizontal output tube.

The 6LQ6 was used in several designs for kW ham amplifiers. Running 1,100 volts on the plate, these tubes would just scream! Output power was nearly 800 Watts. I wonder how they kept them in their sockets.

The 6L6, now called the 6L6GC, was revived for hi-fi audio use and is still in use in this market. Not bad for an idea that was started 50 years ago.

Early Stages of the 6L6 Special

As a dare from the local radio club, I built a 6L6 transmitter from an old *QST* article written by Fred Sutter W8QBW in 1939. The article was one from the QSL series transmitter that W8QBW designed. Using one 6L6, it had an output of about 40 Watts. Photo A shows my small creation. The transmitter was built in about three hours. It worked, sort of.

Jerry Felts NR5A/Ø read about my little circuit and sent in his version. I modified it again and the result is shown in Fig. 1. A 6L6 crystal-controlled oscillator is the basic circuit. I changed the output circuit by using a pi-network. Also, I added a voltage divider to help keep the screen voltage stable during key-down. The final design is shown in Photo B.

I used an 8" x 10" x 3" aluminum chassis for the transmitter. It makes it rather nice to be able to go inside the chassis and wire up a project for a change. You will notice a second tube on the same chassis. More on that one later.

Scouring the Junk Box

Dig up the soldering "gun" and the chassis punches. We're going to build a radio. Before the drill meets the metal, you should have all the parts on hand. If you have been following these columns,

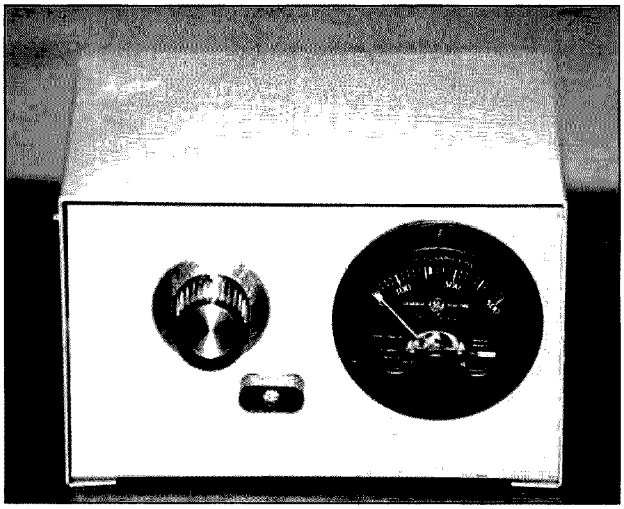

Photo A. My first 6L6 transmitter installed in a box the size of a QSL card.

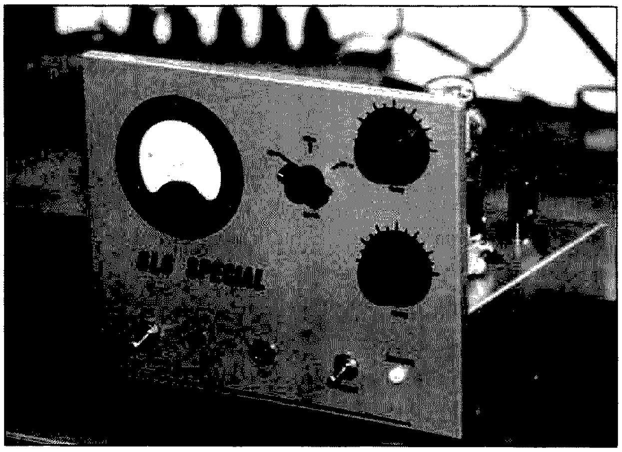

Photo B. Here it is, the 6L6 Special. A crystal-controlled 6L6 transmitter. Output of 12 Watts on 80 meters.

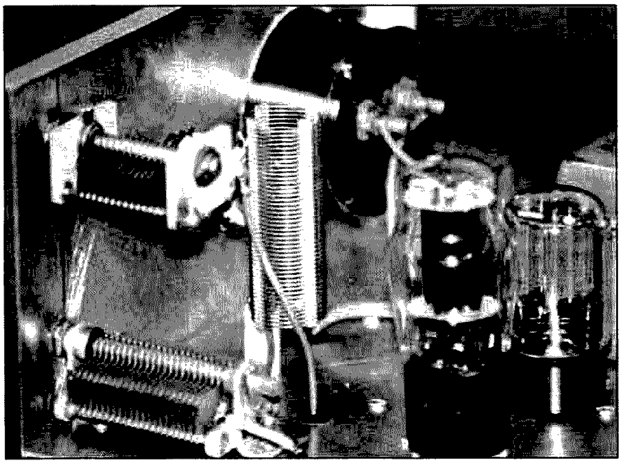

Photo C. Pi-network of the transmitter. The large tube is the 6L6, while the smaller one is the 5U4.

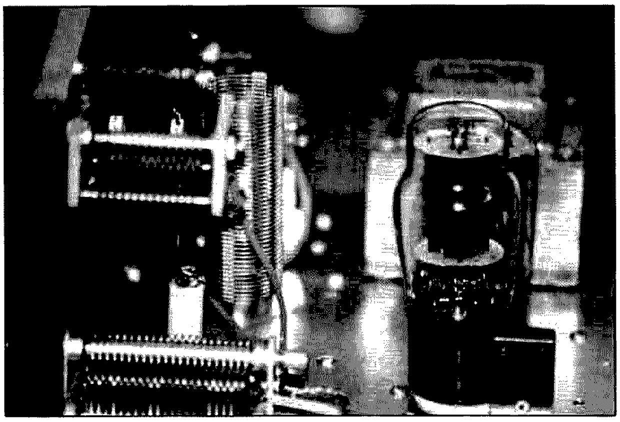

Photo D. Mounting details of the pi-network.

you'll remember that I have never yet been stopped by lack of parts. This project will be the test of part procurement.

My junk box yielded only a small amount of what I needed. I had to turn my shopping list over to Perry W8AU, who is locally known as "Father Radio." Rumor has it that, as a young boy, Perry helped Marconi wire up his antennas. A strong denial comes from him on that subject. However, he was able to pull out from his junk box all the parts needed for the transmitter.

To call Perry's junk box a mere junk box is like calling the *QE2* a boat! Perry has the only three-floor walk-in junk box I know of. Ann, Perry's wife, is always glad to see me with my shopping list, as I always leave with a handful of parts. That opens up a few empty holes on the shelves, which Perry promptly fills back up. A sincere "thank you," Perry.

The circuit is built using point-to-point wiring. Small terminal strips hold the components. Rf runs were done with RG-58/U cable. At this power level, RG-174 could be used also. Pay close attention to the voltage rating of the parts. We are not working on solid state here.

This brings up a very important point. *Use caution when working on this transmitter. Lethal voltages are present when the line cord is plugged in. Discharge all power-supply capacitors before working on this unit. Use common sense.* It sure is no fun to get zapped with 450 volts.

While I used the chassis that was on hand, feel free to use a smaller or larger chassis. I put the plate supply on the same chassis. It need not be so; you could place the supply in a second chassis and use a cord to connect the two units together.

I used a 5U4 as a rectifier for the plate supply. Why did I do that? Well, I was a driven man; I wanted to. Fig. 2 shows the power supply that is in my unit. Sure, it's fine to use solid-state rectifiers for the supply; you'll miss the warm glow of the 5U4, though. My junk box supplied a dual-section capacitor for the supply. It is 40 uF at 550 volts. A 12-henry choke at 80 mA helps smooth out the output from the 5U4. Under no-load conditions, the supply runs 450 volts.

Photo E. Close-up of the chassis. Low-voltage supply mounted on the edge of the chassis.

At key-down the voltage falls to 412 volts.

At this time you may notice that I have not included a parts list for the transmitter. You have to use what you have on hand. For example, the plate transformer I used is a one-shot critter. If it goes up in smoke, I'll never be able to get another one.

The coil used in the pi-network came from Perry's junk box. Looks like 48 turns, 1 inch in diameter, 3 inches long. Tapped about halfway for 40 meters.

Making Adjustments

After the supply is built and tested, finish up with the oscillator circuit. Double-check your work for errors before plugging in the unit. Then plug it in and turn it on. After allowing it to warm up for a few minutes, install a crystal and key the unit up. Quickly adjust the tune capacitor for a dip in plate current. Adjust the load capacitor for an increase in current. Again, re-dip the oscillator. You should see about 12 Watts output on 80 meters and somewhere near 10 Watts on 40 meters.

While listening on a receiver, retune the oscillator for the best-sounding CW tone. Remember all you have here is an oscillator; trying to get too much power out will cause the transmitter to chirp. Using Ohm's Law (remember him), I calculated the input power to be 24.3 Watts. So, I have about 51% efficiency, which is not too bad.

The loading capacitor is a bit small on 80 meters and will not load the unit very heavy. If you have crystals for 160 meters, you will have to change the coil in the pi-network and increase the values of both capacitors.

While I'm on the subject of the pi-network, be sure to include the

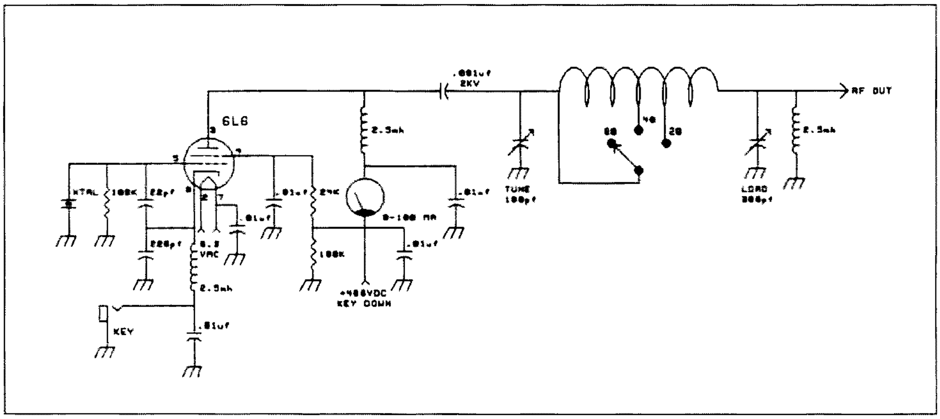

Fig. 1. Schematic of the 6L6 Special.

rf choke on the output. Should the coupling capacitor short, the choke will short the plate supply to ground, blowing the fuse and thus keeping the plate supply voltage off the antenna.

A Challenge

That's about it. I built the unit shown in the photographs in about three evenings. Most of the time was for the metal work on the chassis.

I use an old Collins 75A4 for a receiver when I use the unit. To keep from having to throw a dozen switches to go from transmit to receive, I installed an antenna relay to move the antenna and mute the receiver. The relay that I used requires 12 volts to operate, so I built a small 12-volt supply into the transmitter. A front-mounted switch operated the relay. Nothing hi-tech, but it works fine.

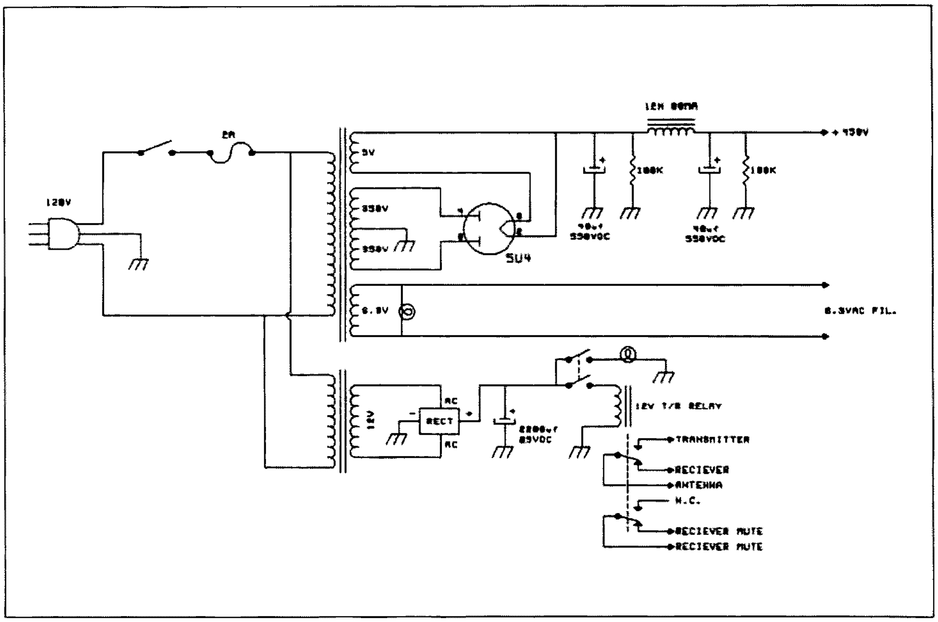

Fig. 2. Schematic of the high-voltage power supply and the low-voltage supply. Relay is used for receiver muting and antenna switching.

I hope this transmitter has your interest piqued. To hang a carrot down in front of your nose, I'm going to be running a small contest. Here goes. Build your own version of the 6L6 special and work all 50 states using a tube that's 50 years old.

Sounds easy, doesn't it? Ah yes, there is a kicker (actually several). Number 1: Your transmitter must be crystal-controlled, using no more than five crystals per band. Number 2: You must send in a photograph of your completed unit. Number 3: No contacts are allowed before May 1, 1987. Number 4: Power must be no greater than 10 Watts output.

Contacts may be on all bands. However, Official Observer reports will not count as states worked! I think after you hit 20 meters, you'll have a real chirper! Photocopies of QSL cards or a signed statement from you and your local club officers will be fine for the award.

Oh my, I forgot to tell you about the award. I will make available to all builders a special QRP Worked All States Award for using the 6L6 Special. You can work your way up to all 50 states with stickers for 30, 40, 45, and 50 states. The QRP ARCI will handle the awards via me. As a special bonus, I'll keep an up-to-date list here in the QRP column for all the world to see. So, do I have any takers?

Keep sending your comments, letters, and photos to me. I always enjoy reading your activities In QRP operation and plan to print up as much as I can.

That's about all the space this month. Even if you don't build the 6L6 special, that's how the hams of yesterday did things. One can learn a lot from the past, because when you get right down to it, that ham ticket is but a license to learn. ■

LOOKING WEST

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INTERVIEW WITH A LEGEND: PART II

Last month I began an introduction of the one individual most responsible for the repeaters that you and I both enjoy daily. His name is Arthur M. Gentry W6MEP, and in the 1950s he put on the air what was to become the grandfather of the modern amateur repeater. I covered the development of relay technology in the southwest, the emergence of Art's K6MYK repeater, and the eventual shift to FM in repeater operation. But, the story of W6MEP's involvement in the development of the concept of relay communication does not end there. I'll pick up my interview with Art by asking about the offspring that his first repeater spawned.

73: It's well-known here in California that K6MYK kind of fathered a number of other repeaters. Tell us about this. . . how about the very famous WA6TDD?

Gentry: As you know, the WA6TDD repeater was one of them. I guess it came about after Burt Weiner K6OQK came to live with us. [*Note: Art and his wife Millie K6JJN have provided homes for many children over the years. Many had a thirst for the kind of knowledge that only an Art Gentry could supply. Art and Millie are a pair of warm-hearted people with a love for humanity. In their own way, they have both dedicated their lives to serving it.*]

Burt had known me a long time. . . from when he used to come over to the TV station. After he was here, he decided that he was going to have a repeater. He literally built a copy of K6MYK. Many things were identical. . . like the same type of control system. . . but he improved on it because we would sit and discuss it. I guess I feel like the grandfather of his machine. He in turn got a remote-control license for the original site on Mt. Wilson, and we have cooperated over the years to this day. WA6TDD was born right here in this garage!

73: This brings us to something else peculiar to southern California. Simplex. . . specifically 146.76 simplex. There have been many stories about .76 over the years. Can you help separate some of the fact from the fantasy?

Gentry: FM in southern California really started on 146.76 MHz, which was simplex. And .76 developed into a very avid simplex channel. For some, it became a way of life in the same way that 145.35 was a way of life in the old AM days. Much the same way that the repeaters are today. There is a personality, a character to each channel. . . whether it's a repeater pair or a simplex channel. So .76 developed along these lines. A lot of its users were converts from the AM group to FM, and that was the frequency to use.

73: Did .76 actually become a society of its own?

Gentry: Yes it did, but .35 was the same way. The old .35 group on AM would get together for parties and T-hunts. I was a hunt-master and a member of that group as well as being involved in repeater activities. It was sort of a combo group. This was the "simplex channel" that the repeater people went over to; .76 simplex is still that way.

73: Is that why there has never been a successful wide-area .16/.76 repeater in Los Angeles?

Gentry: This is because of the traditions involved. Even today you will hear people say, "I've been on .76 since the day it opened and I think that I have a right to stay there." That's the way that they feel.

Now, because of the then overpopulation on .76, the early FMers needed to go somewhere else. I think that people next went to .94 because it was one of the standard "60-kHz channels." I wasn't involved in choosing that frequency, and I don't remember all the details. But, a great many of the commercial FM people became involved in .94, and at this point many of the famed pioneer California remote-bases were born. So, .94 became the de facto channel of those people who wanted to operate remote-controlled stations.

This brought on a kind of "competition" between the two modes of operation...that is, simplex versus remote base. If the remotes came onto .76, the .76ers would jam them. If the .76ers showed up on .94, the remotes would do the same. Actually, it was nothing more than the two groups trying to settle their differences and run their operations without interference. Through the years, people learned to negotiate and it was all settled pretty well.

73: Even though you yourself were already a repeater and remote-base owner, didn't you eventually become the spokesman for 2-meter FM simplex to the California repeater world?

Gentry: Sometime in the early 1960s, the old California Amateur Relay Council (referred to as CARC) was born. The owners of all repeaters and remote-bases were invited to join. Most of them did, and I was a member of that council for a good many years. They held meetings all over the state. But, I think this was really the beginning of any sort of organized voluntary frequency coordination in the nation. At least it was in California.

In southern California, this was definitely the beginning of any type of coordination... through the southern California representatives to the council. Southern California had not yet gone for all-band coordination at the time as a general rule. Oh, they had on 450 MHz...early... long before coordination anywhere else...because with the growth of remote-bases came the need to have interference-free channels.

Also, another aspect that many may not understand is a concept...one that says that while I might not have a transmitter on the air every moment of the day, that channel pair is still busy. This pair is busy right now. It's busy monitoring the downlink, and if I turn the link on, I need a clear channel.

People have said that they can tune across the entire 450-MHz band and never hear anything. That's true, but only because they don't know where to listen or what's really going on a given channel or what a given channel pair is used for. I think that in the future, the privilege of that type of spectrum usage has to be protected because there will come a time when uninformed people may say that there is nothing on this or that channel pair...and I or my system is going to use it. If that were to happen and if I found that I could no longer control my repeater, I would be forced to shut it down.

73: How does a repeater owner handle a situation like this?

Gentry: This is something that has to be explained and written about at every opportunity. It's a matter of education, of explaining that some of this stuff does not come easily.

People put out a lot of time and money to make repeaters possible. In my opinion, we have to get through to the ARRL and through them to the FCC and make them understand that there is a need for a band that is exclusively for control systems. Repeater owners need some protection in the FCC rules so that when the average amateur goes out and purchases a new piece of equipment he knows that there is a section of the band that he cannot use.

A lot of 2-meter machines are now controlled on 220 MHz. Think of the chaos that can occur if 220 gets as busy as 2 meters is now! I feel quite strongly that this may well happen, and if I were a much younger man, I would be in there fighting or doing what I can.

73: You have done a lot of fighting for other people over the years. You helped to open repeater councils here in California to users as well as repeater owners. Why?

Gentry: Let's say this. I am a repeater owner, but way back in the beginning I felt that everybody should be able to use a repeater. Why should it be exclusive?

It's fine if somebody wants to have it private. I have my own private system on UHF in addition to the open 2-meter machine, but this does not mean that I do not strongly believe in open-channel operation. I've had many battles with other hams who claim that open-channel machines are no good. Well, in a sense of the word, they are plagued with problems, but I am hoping to find solutions! I have no idea what they may be, but I do know that they will come from a better education of users. When users know and understand better...when we get rules and regulations that help us to police our bands...then.

The FCC says that we are self-policing. That's the wrong terminology. We are not self-policing. We have no police powers. The FCC does not give us any. Rather, we are self-regulating. We help set our own rules. And, we can enforce our rules, but we cannot police. That's the FCC's responsibility.

But back to the question...I think that we can date the start of the change to when Bob Thornburg WB6JPI became president of the old Southern California Repeater Association...the SCRA. [*Note: When the CARC was dissolved, though not disbanded, it gave birth to three offspring of its own. One was the Northern Amateur Relay Council. In the south, the Southern California Repeater Association and the Southern California Repeater and Remote Base Association took root. SCRA coordinated 2 meters and 1-1/4 meters until 1979, when it gave way to the current 2-meter and 1-1/4-meter spectrum management associations: TASMA and 220-SMA.*] By this time the SCRA's repeater owner membership was very small. Possibly because the SCRA had gotten involved in a battle over .76 simplex and a repeater that wanted to use the .16/.76 pair. In reality, they had no way to go except to get in and fight, and I must say that they did an admirable job. However, that had an adverse effect, since here was a group of repeater owners involved in a big dispute that, in reality, they didn't want to be involved in. That probably drove away a part of the membership.

Anyhow, before that I had become the representative of the simplex people to the SCRA, and I took the floor at the very first meeting and tried to state that the organization had to think about all users of 2 meters...and, I was sort of laughed at because everyone there was a repeater owner. So many of them had not yet learned that the power lies in the multitude of the people. You see, each time a new station comes onto an open-channel repeater, there is a vote of approval for that repeater, for its use of that pair of frequencies. Therein lies the seat of power, if you will, in the whole matter of voluntary frequency coordination.

73: Art, here's a real sticky one. Do repeater owners then fear their users?

Gentry: Let me answer it this way. Probably the basic attitude of nearly everyone who gets involved with putting up a repeater—be it an individual or a small group—is that they know their problems; they want to solve their problems and do not want to look elsewhere. Many don't accept outside help; many lose sight of the fact that they are using a pair of frequencies that everyone else is entitled to use. It's only by the grace of all the users of the band that repeater owners can have a pair of frequencies that are dedicated to a repeater.

73: What about the future?

Gentry: I sincerely hope that more of the users become involved in organizations such as TASMA, 220-SMA, and the like, and that they will become better educated about the problems we all have regarding what it takes to run a repeater.

You can hear new people come on the air every day. They walk into a radio store and a guy sells them something. But, nobody ever tells him what the score is or the responsibilities that come with

"The next time you key up your favorite system, you might want to pause a moment and give thanks to the man who made it all possible."

that new radio. Again, this is a place where the ARRL and the other ham magazines should step in. Somebody is going to have to step into this void and take the lead. I've been an ARRL member since 1938, and I wish that they would do it.

I guess I believe that somebody could step in and become the champion of all of these people and educate them. Possibly, this is the next step for our repeater and spectrum management groups. It's analogous to buying a boat and then learning to sail it through proper instruction or getting a driver's license to take a car on the street or freeway. We do this for our own personal protection and that of society. It's the same for repeaters. There has to be this education, or all of these people who have gone out and bought channelized radios could eventually be left holding the bag for a lot of equipment that they have purchased, but that might be unusable if chaos breaks out.

What you have read the past two months is an abbreviated version of more than two hours of a tape-recorded interview with amateur repeater pioneer Art Gentry W6MEP and numerous other conversations between us over the years. I have tried to keep from paraphrasing Art's responses, although some were very long and required editing to be included in this mini-series. I sincerely hope that you enjoyed meeting the man who definitely deserves the title of "Grandfather of the Modern Amateur Repeater."

I consider myself very lucky to be able to call Art a personal friend, a man who made me welcome on the radio almost on the day I moved to Los Angeles many years ago. I only hope that some day our great service will see fit to bestow on W6MEP the accolades he deserves.

In the meantime, the next time you key up your favorite system, you might want to pause a moment and give thanks to the man who made it all possible. Or, better yet, look up W6MEP in the Callbook *and drop him a QSL card that expresses your appreciation.*

And, for this month, that's it from those of us who work and write the late shift in the City of Angels. ■

HAMSATS

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IT WORKS!

How about a two-way packet QSO with West Germany using VHF and UHF and only one packet digipeater? It's been done!

In last month's column, I had nothing new to report on mode JD (digital), but since then things have changed drastically. The digital mode on Fuji-OSCAR 12 has been activated with many firsts occurring both here and overseas.

On February 24th, Peter DB2OS in Hannover, West Germany, found the JD transmitter active with PSK (phase-shift keyed) telemetry. He tested one of the four 2-meter uplink frequencies and then connected to himself via the satellite.

News of this success spread. On the 26th, at 2000 UTC, the first successful West Germany to Belgium JD QSO occurred with DB2OS and Freddy ON6UG. The contact was relatively short, but there was enough time to exchange names, QTHs, and regards, and to marvel at the quality of the connection between Hannover and Ghent. A little over three hours later, the first stateside JD contact took place.

On FO-12 orbit number 2466, I found the JD transponder not only ON, but loud with the 435.910-MHz (SSB/PSK) beacon sending telemetry. (An earlier example of FO-12 telemetry can be seen in the February HAMSATS column; the PSK packet modem designed by Jim G3RUH was shown in the March issue.) After verifying that the tape recorder was running and the computer was ready, I tuned up the 2-meter transmitter on 145.890 MHz (FM/PSK) and tried to connect.

It worked! After a few path tests, Ed KA9LNV connected to my station, and the first U.S. digital Fuji QSO commenced.

I was quite surprised to find anyone on JD, but also delighted to make contact. Ed had connected to himself on a pass earlier in the day and was just waiting for someone else to show up. A portion of our contact is shown in Fig. 1. Note that the conversation is mixed in with the satellite telemetry. This may appear confusing, but actually is not as bad as trying to carry on a terrestrial packet QSO while someone else is accessing a bulletin board on the same frequency.

The system on my end included a Yaesu FT-901 DM for reception, a Yaesu FT-902 DM for transmit, the FTV-901R transverter for 2-meter and 70-cm conversion, and the FV-901 DM synthesized vfo for receiver frequency control. I also had a 2-meter power amplifier, a Hamtronics 70-cm preamp, the G3RUH-style FO-12 modem, a GLB TNC-2A, and my heavily modified TRS-80 Model I computer. The antennas included a KLM 2M-22C for the uplink and a Cushcraft 416TB for the 70-cm downlink.

With KA9LNV up in Columbus, Indiana, things weren't quite as complicated, but the system was quite functional and later yielded some good transatlantic connects. Ed used a Yaesu HT with home-brew amplifier running 30 Watts for the uplink. The receive system incorporated a home-brew GaAsFET preamp to a Microwave Modules 70-cm converter and a Kenwood TS-430S HF rig. Other equipment included the G3RUH modem, a TAPR TNC-2, and a Radio Shack Model 100 computer. The antennas were homemade, with 12 elements on 2 meters and 19 elements on 70 cm.

Two days later, more players were on the scene on both sides of the Atlantic. Over here, Tom Clark W3IWI and Bill WB7QKK were on the air. In Europe, Jim Miller G3RUH and others, including ON1KVH and HB9XJ, had their systems on line with successful JD operation. The first verified transatlantic QSO goes to W3IWI and G3RUH. Close behind were KA9LNV, ON6UG, and DB2OS. Although I have no word yet from Japan, it is likely that activity has been increasing in the Pacific as well.

The Catch

Some have called mode JD a failure since it cannot be operated continuously. The power available from the solar panels is not enough to run the on-board computer, a megabyte of memory, and a 1-Watt transmitter all at the same time. The satellite's 6-Amp-hour battery plays a very important role. During darkness and JD operation, it provides the extra power to the system. Sufficient recharge time must be allowed to avoid dangerously low battery voltage and possible battery damage. An experimental schedule derived for the late-February JD activity included a five-minute on/off cycle imbedded in a two-hour on/off cycle imbedded in a one-day on/off cycle.

On each scheduled JD operating day, the command station in Tokyo would uplink the necessary software to the on-board computer. The computer would remain on even when the transmitter was off until the following day when the satellite would be commanded into recharge mode D.

For one orbit on February 26th, FO-12 was in mode JA, but was later commanded to JD. Passes with short acquisition time and low antenna elevations, as seen from Tokyo, were not used by the command station for satellite software changes. On February 28th, the first good pass apparently was missed, or the programming could not be uplinked. The on-board clock was about two hours, or one orbit, behind.

The most difficult part of the experimental schedule is the five minutes on followed by five minutes off. It is rather difficult to get a good packet conversation going in such a short time. Also, the satellite is not functioning at full potential. The available power will never be enough for continuous bulletin-board-in-the-sky operation.

With rotors to turn, Doppler shift to counter, typing to contend with, and many other items to watch, this JD stuff is hard work. It makes for a great experiment, though. Just working around the several pitfalls has been quite a tantalizing challenge to many prospective JD operators.

What It Takes

To work mode JD, you'll need an FM 2-meter transmit system with 100 Watts erp (effective radiated power). You can do this with 100 Watts to a ground-plane antenna or 10 Watts to a 10-dB-gain beam antenna. Almost any 2-meter-FM rig can be used if it is capable of putting out rf on one of the four available uplink frequencies:

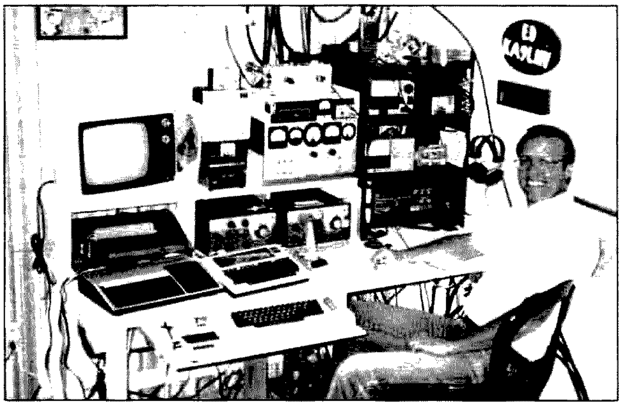

Photo A. Ed KA9LNV, avid satellite chaser, AMSAT supporter, and packet enthusiast.

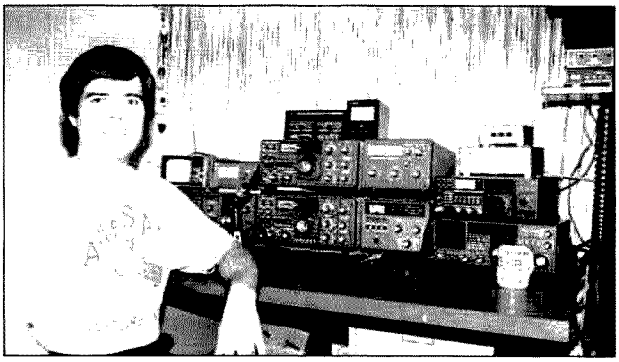

Photo B. WA5ZIB—the other half of the first U.S. Fuji-OSCAR 12 mode-JD QSO with KA9LNV.

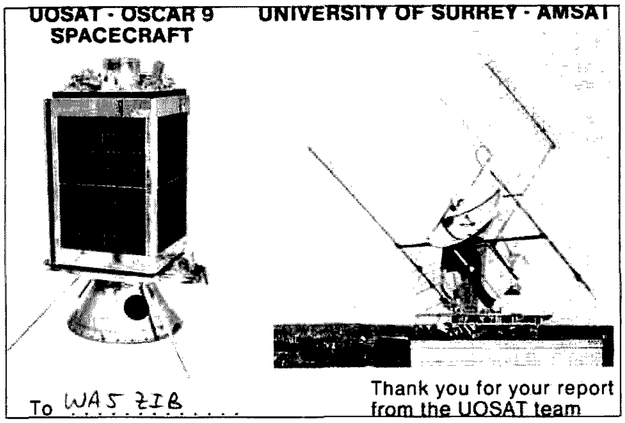

Photo C. UoSAT-OSCAR 9 OSL available from the University of Surrey UoSAT Unit for a reception report.

Photo D. UoSAT-OSCAR 11 QSL, also from the University of Surrey.

145.85, 145.87, 145.89, or 145.91.

For reception a beam antenna would be best but isn't a necessity, since the downlink signal is quite strong. Its "sense" is right-hand circular, the opposite of the analog, or JA, downlink. The two modes share the same receive antenna but have separate transmitters and antennas for the downlinks. I use a simple Hamtronics bipolar preamp in the shack with excellent results, but a GaAsFET preamp at the antenna would be better.

The radio must be capable of SSB reception on 435.910 MHz. The easiest way to do this is with a 70-cm receive converter. Commercially made units are available from Advanced Receiver Research, Hamtronics, and Microwave Modules.

Any good HF receiver or transceiver should complete the downlink system as long as its frequency can be controlled digitally from an external source. Neither of my rigs has this feature. It is necessary to use the external vfo since it uses extensive digital circuitry for tuning. The appropriate up/down control lines were brought out to a connector.

Two basic modem designs have provided the necessary functions for successful JD operation. The first documented design available was introduced by Jim Miller G3RUH. Its construction, calibration, and uses are fully described in the February, 1987, issue of *Ham Radio*. Complete kits are available from Radio Kit, PO Box 973, Pelham NH 03076.

The other design has just recently been announced for sale. It is based on the PSK demodulator by Fujio Yamashita JS1UKR, shown in the August, 1986, issue of *QEX*. The PSK modulator and other circuits by Lyle Johnson WA7GXD of TAPR (the Tucson Area Packet Radio group) and Tom Clark of AMSAT (the Radio Amateur Satellite Corporation) also are integrated into this design. This new TAPR modem will be supplied in kit form, and will include the three PC boards and all required parts except the enclosure. The TAPR phone number is (602)-746-1166.

```
WA5ZIB>WA5ZIB:
HELLO TEST! DE WA5ZIB

8J1JAS>BEACON:
JAS-1 M0 87/02/26 23:41:00
Telemetry Information:
#00(1st):solar cell current = 1.91*(N-4)    mA
#01(2nd):battery current    = 3.81*(N-528)mA
#02(3rd):battery voltage    = N/1000*21.0   v
#27:bat depth of discharge  = (N-500)/189 AH

** CONNECTED to KA9LNV

8J1JAS>BEACON:
JAS-1 RA 87/02/26 23:43:18
257 558 707 713 768 870 890 864 003 354
646 002 588 630 619 616 617 617 688 001
722 710 722 716 758 677 926 489 000 000
010 111 100 000 100 000 001 100 101 000

WA5ZIB>KA9LNV:
HOW COPY

8J1JAS>BEACON:
JAS-1 RA 87/02/26 23:43:52
227 574 705 710 766 879 890 864 003 354
646 002 586 630 619 616 616 617 688 001
222 711 722 715 757 676 926 490 000 000
010 111 100 000 100 000 001 100 011 000

HELLO ANDY FROM ED, COLUMBUS INDIANA!

8J1JAS>BEACON:
JAS-1 RA 87/02/26 23:43:56
223 577 705 710 766 879 890 863 003 355
646 002 586 630 619 616 616 617 688 001
722 711 722 715 757 677 925 490 000 000
010 111 100 000 100 000 001 100 111 000

WA5ZIB>KA9LNV:
TNX FOR CONNECT

8J1JAS>BEACON:
JAS-1 RA 87/02/26 23:44:04
210 583 705 709 765 878 891 864 003 364
646 002 586 629 619 616 616 617 688 001
722 711 722 716 758 678 926 490 000 000
010 111 100 000 100 000 001 101 101 000
```

Fig. 1. A portion of the first U.S. Fuji-OSCAR 12 mode-JD QSO between WA5ZIB and KA9LNV.

Finally, you will need a TNC. The FO-12 modem interfaces with only a few wires but requires cutting one PCB track inside the TNC. Most TAPR-style TNCs will allow easy bypassing of the internal modem. All that is left to add is a terminal or computer with an RS-232 port and communications software.

Too many things require attention during each JD pass to allow for casual note-taking. Hard copy or memory storage is best, but a simple alternative is to record the received audio on a quality cassette deck. It can be played back later through your system. These methods will help keep your log straight and allow for later study of the telemetry that was received during your packet contact.

When you get all the pieces together for Fuji's digital mode, you will have an impressive array of wires and boxes. To make contact with another station via the satellite, do not include a "via" in your contact request. If you were to see my call between the frames of telemetry, just send: C WA5ZIB. The satellite will simply transmit all valid frames without any modification. Later, you will see further schedule changes and software upgrades as the satellite controllers in Japan learn more about FO-12's impressive capabilities.

UPDATES

AMSAT-OSCAR 10 is still in a period of low solar illumination. Continue to avoid all use of AO-10 until early May when once again the sun angle will provide sufficient power for transponder activi-

ty. If there is cooperation with the call for suspended operation, you increase the chances for future activity. Check the AMSAT nets for updates.

UoSAT-OSCAR 9 and UoSAT-OSCAR 11 continue in good health. On Wednesdays, UTC, the digipeater on Uo-11 is activated for a short period during each pass. On Sundays, between 0000 UTC and 1200 UTC, the 435.025-MHz beacon is activated simultaneously with the 145.825-MHz beacon. The team at the University of Surrey will appreciate reception reports from listeners. Your card will ensure that better services are provided on a continuing basis.

Listen on 145.825 MHz FM and report to the UoSAT Unit, Attention: Martin Sweeting, University of Surrey, Guildford, Surrey, GU2 5XH, England. If you request a QSL for your reception report of either satellite, be certain to include a self-addressed envelope with sufficient IRCs or British postage for the return trip.

Radio 5 and Radio 7 may still be operational, but due to the poor battery conditions on both satellites, you will have to look to the nets and your own observations to determine their condition.

There has been little word on the status of either Radio 9 or Radio 10. The extreme cold during January caused a backlog on the Soviet launch schedule, but if things go well, there may be new satellites about the time you read these words. Monitor the AMSAT nets for the latest news of these pending launches.■

ABOVE AND BEYOND

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Doylestown PA 18901

TRY SOMETHING NEW

As most of you know by now, the FCC has finally resolved (in their own mind) the question of what to do with 220 MHz?" In their own unique fashion, they've proposed (as this is being written in early March) to cut the band by 40%, cram all of the weak-signal/moonbounce/packet/link/FM/repeater operations into the remaining 60%, and wash their hands of it once and for all.

This is definitely one of those "the operation was a success, but the patient died" situations. In fact, as many of you read this, the deadline for reply comments has come and gone (unless an extension has been granted), and, in fact, the dissection of 220 will become reality.

The proposal (NPRM 87-14) is so well detailed, it indicates that the commission has virtually decided the question, regardless of any input from the amateur community. What scares me is the wording to "give the Amateur Service an Exclusive allocation at 222–225 MHz," which indicates that the jury has delivered the verdict, the judge has mandated the sentence, and the only thing we can hope is that the rope breaks on the gallows.

Regardless of the outcome of this NPRM, the situation didn't have to come about. All it would have taken is a bit more activity on everyone's part to enhance the status of 220 MHz in the commission's eyes. Honestly now—how many of you own at least one piece of 220-MHz gear? Probably a hand-held if anything.

The lead editorial published a few months back in *73* made mention of the dollar value of the various amateur allocations if placed in the hands of commercial interests. Don't take it lightly! How do you think the Electronic Privacy Act of 1986 came about?

"What's the point?" you ask. The point is—try to break out of the rut. If you've thumbed through *73* and the other magazines thinking, "Gee—it might be fun to try OSCAR or listen to satellite transmissions," don't think any more. Whip out that wallet or checkbook—call the 800 number—put your order in for a 70-cm multimode or transverter, amplifier, and antenna. Try operating a little on 50 MHz with a borrowed rig before you say, "The band's too quiet" or "I'll get TVI complaints" or "How far can you work on 6 meters, anyway?"

The TH-31AT I reviewed last year cost me all of $225 for the radio, two batteries, charger, external antenna adapter, and cigarette lighter cord. With it, I've worked through repeaters in New Hampshire, New York, South Carolina, Chicago, and Arizona while on business trips, and the whole thing slips in my shirt pocket.

Got a VCR? A camera? How come you haven't tried ATV yet? There's certainly enough equipment available to get you on in a hurry at the right price.

Want to really work hard for a contact? Try mountaintopping on 902 or 1296 MHz with high-gain antennas and a few Watts of power.

Think working halfway around the world on 20 meters is fun? How about halfway across the U.S. with 2 Watts on 23 cm (as was done during the now-infamous Thanksgiving tropo opening)!

Got a personal computer sitting around doing nothing? Get on packet. TNCs abound! Hop up on 220 and get away from the crowd on 145 MHz.

Want to see what the weather will really be like tomorrow? Pick up a satellite converter and see what you're missing.

Tired of working repeaters on 2 meters? Flip that switch marked "USB" or "CW," get a horizontally polarized beam, move down to 144.200, and start calling CQ. Ever work 2-meter SSB mobile? 6-meter FM mobile?

Of course, I could go on and on. The point is—we have a wealth of spectrum space just beckoning to us. As the impact of Novice Enhancement becomes felt, it is incumbent that we retain these higher frequencies for the future when we will really need them. But we must get on now and encourage activity, otherwise the 220-MHz situation will just happen again and again.

Come on—make 1987 the year you'll try some new piece of equipment on a new band. Check out the reviews in *73*. If building's your thing, there are plenty of places with kits to get you up and running. And, of course, you can never spend enough time experimenting with antennas... can you?

FUN THINGS TO DO

Now that I've had a miserable time trying to operate portable during winter contests, it's time to plan the summer contest schedule. The problem has always been one of portability—being able to bring the "most" in a station with the "least" in weight. Up until now, that meant 2- and 6-meter multimodes with linear transverters for each band. It shouldn't surprise you, then, that the ads for Yaesu's new FT-290R and FT-690R MKII series caught my eye.

Aided by our ever-loving editorial department, I was able to procure one of each for the ultimate review: Drag 'em up the mountain and see if they make it! Photo A is a shot of the units. Indeed, they make a nice tidy package, and this is accomplished in a unique way: The front end, low-level TX, and microprocessor stages are encased in a separate housing that either (1) snaps onto a heat-sink/power-amplifier combination for instant mobile use with 25 Watts on 2 and 10 Watts on 6 or (2) snaps onto a battery case containing nine C cells to provide 2.5 Watts of rf output on either band.

If you really want to find out how good your hilltop location is, try a couple of these with some portable antennas such as a quagi or collapsible beam (Tonna makes a nice one for 144 MHz). Think of it—two independent, self-contained stations for 6 and 2 with antennas and the thing weighing about 30 pounds including the masts! Both radios operate CW/USB/LSB/FM, and both have ten memories, dual vfo's, an easy-to-read LCD display, and the ever-present RIT control, labeled CLARIFIER.

I plan to haul these up a few peaks for as many of the summer contests as time permits—possibly even with outboard amplifiers if I can bring a bigger power source. It should be fun, so look for a review sometime in the late summer.

How about you? Ever try mountaintopping before, even if only with a hand-held? At least one summer contest recognizes the efforts of QRP and portable stations (*CQ* WW VHF WPX) with a trophy if you are high-scorer in your category. Even if you're not into contesting, take a walk up some hill nearby or hike into a rare grid square and put it on the air with your little station. It'll require a bit more operating skill on your part, but I guarantee it'll be more fun than sitting home rag-chewing on 146.52 MHz sim-

plex. If you want to bring the computer along, then go portable packet. That should keep you quite busy!

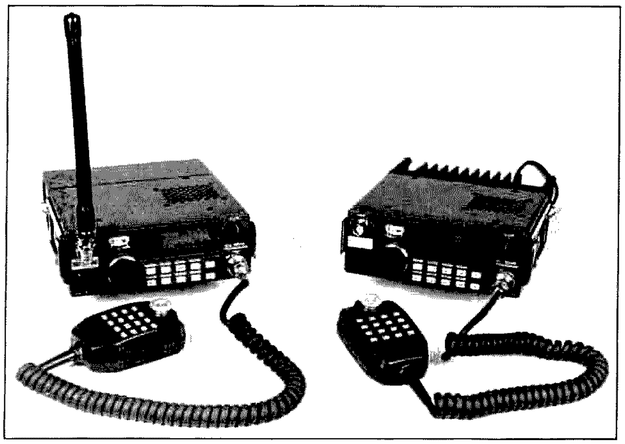
MAILBOX DEPARTMENT

Some interesting correspondence has crossed my desk in recent weeks, and I'll pass it along. Walt Werner W2TT of Tinton Falls, New Jersey, writes in to discuss the "Watts 'N SWR" article from October, 1984. Boy, old articles never die! He expresses interest in constructing an swr bridge using five sections of 1/8-wavelength transmission lines, based on a circuit in the December, 1986, *RF Design*. Walt goes on to inquire if I'd be interested in manufacturing a prototype of such a design on a printed circuit board.

Well, my experience with PCB design hasn't gotten that far, Walt, but there might be a reader who'd have more on the ball in this area. I don't think I've fabricated a PCB in about a year (time problems, mostly) and haven't had a chance to review the article you've mentioned. How about it, folks? Anyone willing to give Walt a hand in trying to fabricate such a coupler for 144 MHz should drop him a line at 131 Woodland Manor, Tinton Falls NJ 07724.

Ross Forbes WB6GFJ writes in to mention a problem common to TS-430S owners using transverters: nonlinear output power control. The only way to vary the output of the TS-430S is by using the CARRIER control, but generally full output is reached when the control is at about half setting. Ross mentions that he'd like to be able to throttle back the output of his MMT 432/28S for OSCAR work as needed. The only easy way to do this reliably is to use a stepped attenuator after the XVRTR OUT connection on the 8-pin DIN plug before it goes to the 28-MHz input on the MMT 432/28S.

Such pads are easily found at flea markets—I bought two for $5 at such a flea market two years ago. Both offer a total of 30 dB in switched steps of 2, 4, 8, and 16 dB. The switches can be ganged to create intermediate values. With such a system, you then set the CARRIER control to its full clockwise setting and leave it there. Also set the MIC GAIN control to its normal setting and leave it untouched. The MMT 432/28S is a very linear device down to about −10-dBm input levels and will respond accordingly to switched values of attenuation at the 28-MHz input.



The Yaesu FT-290R MKII and FT-690R MKII transceivers configured for portable operation (left) and mobile operation (right). KT2B will soon be hauling these revolutionary rigs up into the hills to do a comprehensive review.

I'd also like to thank the following folks for adding me to their mailing lists: Gene Shea KB7Q of Montana, who publishes the *2 Meter EME Bulletin* ($15/year, 417 Staudaher Street, Bozeman MT 59715), and Charles Osborne WD4MBK, who publishes an interesting compendium of general and technical information periodically, called the *Southeastern VHF Society Newsletter* ($5/year, 881 Lakeshore Drive, Berkeley Lake GA 30316-3041). Charles has been the source of much useful information lately, especially regarding the KLM balun problem and ways to correct it.

The *Southern California Six Meter Club Newsletter* (PO Box 448, Cypress CA 90630) arrives faithfully each month from the West Coast and contains some interesting stories, including the club's monthly transmitter hunts. (Boy, would the FT-690R be good for that!) And finally, the folks in Woodlands, Texas, have gotten their name straightened out and have formed the Gulf Coast Microwave Society (PO Box 7853, The Woodlands TX 77387) with the intent of promoting activity on and above 432 MHz.

Now, look carefully. See all of those names I just mentioned? Besides them, there are probably hundreds of other clubs I don't know about that exist to promote a segment or mode in the VHF/UHF/SHF/EHF spectrum. The above groups are active; they publish, and best of all, they'd like to share their information with you (albeit at a price). I will try to update the listing of clubs and newsletters as I can during the year, and hopefully the entire December column will be a compendium of such material for future reference. Drop them a note and let them know you're interested!

REMEMBERED

The various magazines regularly note the passing of amateurs from the scene. Some were celebrities; others just another guy or gal down the block. I'd like to take a minute to remember someone important to me . . . my uncle, Raymond Putman N2FYC, whose life was claimed by cancer on February 19, 1987, at age 64. Ray had only been licensed for four years, but quickly rose from Novice to Advanced in that time period. He was into everything—2-meter FM, HF SSB, teletype, antennas, and even computer operations. Some of the *73* crowd will remember him as part of the infamous "SCORE" gang at Dayton the past two years.

I'll remember him for one main reason: Ray rekindled a lot of enthusiasm in me for amateur radio that had been sort of dormant over the years. It's quite refreshing to see somebody dive in with so much enthusiasm at an age when many other hams are content to sit around grumbling about the QRM on 75 meters. Here was a fellow who loved to work with his hands, and in short order was constructing antenna tuners and keyers from scratch. I didn't know you could use electrified cattle wire for an 80-meter dipole until Ray showed me how he did it!

Beyond all else, Ray found the real value of amateur radio: making friends. Boy, did he! Ray was an active member of the Watertown Radio Club, many of whose members I had only rag-chewed with from time to time on the 10/70 repeater in Watertown while passing through. It was an honor for them to be his pallbearers, and I was privileged to meet them. He was also active on the Carrier Net on 75 meters, and puttered around on 160 as well. Besides that, he found time to remodel his house, pursue his rockhounding, and make his own clothes—the envy of any tailor.

I only hope that other hams who were lucky to have met him will have some of that enthusiasm kindled in them as well (or rekindled as the case may be). This is the legacy that Ray left to amateur radio: Try to find something different every week to do with ham radio. It wouldn't hurt if you made a few friends along the way, either. My condolences go out to his wife Louise and children Mark and Shawn. He will be missed.

ADDENDUM

Just as I was getting ready to send this month's column via the modem to Peterborough, an excellent directory of 6-meter activity, repeaters, and DX listings arrived from Harry Schools KA3B. This is a very thorough listing of virtually anything and anybody pertaining to the 50-MHz band, and lists nets, newsletters, an extensive repeater directory, beacons, 50-MHz awards (and rules), and major contests, to name just a few categories! Obviously, Harry put a lot of time into this directory. If you are a serious 6-meter operator, you should have a copy. For further information, write Harry at 1606 S. Newkirk Street, Philadelphia PA 19145.

Also, news has come via Roger Cox WBØDGF and the Midwest VHF Report of some strong 144-MHz Es openings in February (!!!) from California to Kansas and Nebraska. (And you were waiting for the summer!) Other openings occurred from California to Oklahoma and Texas about the same time. The point? Keep those receivers on the calling frequencies—even in the dead of winter. You never know what will show up. Until next month, see you Above and Beyond! ■

WEATHERSAT

Dr. Ralph E. Taggart WB8DQT
602 S. Jefferson
Mason MI 48854

Date	01 May 1987	
Spacecraft	NOAA-9	NOAA-10
Orbit Number	12267	3204
Eq. Crossing Time (UTC)	0050.85	0011.20
Longitude Asc. Node (Deg. W.)	146.18	69.45
Nodal Period (Min.)	102.0851	101.2979
Frequency (MHz)	137.62	137.5

These orbital parameters are projected two months in advance due to deadline considerations. Accumulated errors due to uncompensated orbital decay and other anomalies result in expectation of errors up to two minutes and possibly as many degrees in terms of the crossing data and possible small changes in the indicated period. Users requiring precision tracking data should rely on more current sources.

Table 1. TIROS/NOAA orbital predict data.

WSH SCAN CONVERTER

This month I am going to spend some time discussing the *WSH* scan converter since I get quite a bit of mail from readers who want to know what in the world I am talking about. In covering this ground, I will also address some general problems in using computers for scan conversion.

First, the *WSH* part is easy—it refers to the third edition of the *Weather Satellite Handbook* published by your faithless columnist. It costs $12.50 plus $1 postage in the U.S. and $2 elsewhere. That takes care of this month's plug!

Now to the scan converter part. There are two basic approaches to building a digital scan converter. You can construct a dedicated unit with either hard-wired or built-in microprocessor control or you can build a unit around an existing microcomputer. The latter is usually a desirable alternative because you save yourself a lot of effort and get the flexibility of easy software changes should you wish to experiment.

The nicest option would be to require nothing but a computer and some software, but that presents many problems. There are quite high-priced (by the standards I will be talking about later) computer options that can generate a sufficiently high resolution image with enough grayscale values for each pixel to be quite acceptable. Unfortunately, such a system would be applicable only to those with the cash to purchase a similar computer.

Even if you wanted to spend the money for the computer, you would still require some additional hardware to provide satellite signal processing, A/D conversion, and some sort of timebase. You would also require software. Unless you can write your own, you will find that there tends to be less software available for expensive computer configurations and what there is tends to cost more—it's called free-market economics!

Less expensive computers have a larger user base, which translates to more programmers, but here we run into other problems. Low-end personal computers and even 16-bit systems with standard or moderately enhanced graphics capabilities (i.e., CGA and EGA standards) may have sufficient resolution, but they tend to be color-oriented and you cannot spend a lot of time looking at false-color images.

What you really want is a decent monochrome display with at least 16 grayscale steps per pixel. It is far easier to add false-color capability to a good monochrome display than to try to persuade a 4-color display to do the job!

The key around the spatial/tonal resolution dilemma is to use a dedicated display circuit, complete with its own RAM, that could care less about the graphics capabilities of the computer it is connected to! The computer and its RAM will be used to sample and store incoming image data, but you will not depend on the computer to *display* the image—that's a job for the external display board.

Since any computer system is going to require additional video processing and timebase circuits, these can be added to the external display circuit. This results in a single hardware add-on that, with proper interfacing and software, should work with any computer!

That is exactly what the *WSH* scan converter is—an external board that provides all the display, satellite video processing, timebase, and computer interface functions. The circuit uses 32K of static RAM (a single 43256 or four 6264s) and produces a 256-line image with 256 pixels/line and 16-step grayscale coding.

The video circuits include agc, video pre-filtering, full-wave detection, and post-detection filtering. The timebase circuits involve a crystal oscillator and phase-locked loop for compatibility with both "live" and tape-recorded imagery. The keynotes of the design are simplicity of construction and setup and low cost.

Only 14 ICs are used; the total component cost to stuff the board will range from $60 to $75 (mail order, depending upon supplier and memory option selected), and the entire board can be checked out with nothing more elaborate than a logic probe and multimeter. Connection to a host computer is *not* required for board setup. False-color capability can be added with a single connector if you have an RGB (8-color) or RGBI (16-color) computer monitor available.

Photo A. The default full-frame display of a METEOR 2-15 pass obtainable with any CoCo model using the 120-lpm mode. Michigan and the Great Lakes are near the center of the image, the East Coast is angling upward in the lower right, and most of the upper half of the picture shows Ontario and Quebec.

Features for the RAM

While the *WSH* converter board provides all of the circuits for 256 x 256 display on a standard TV monitor (or TV set if an rf modulator is used) and all of the required satellite signal circuits, what can be accomplished at what level of difficulty is a matter of what computer you have it hooked up to.

If you have a 64K 8-bit system, you really don't have that much more available RAM than is required for the basic display (32K), so you are basically restricted to sampling 256 pixels from 256 lines. Essentially the computer sampling must match the display capabilities. Although there are some high-resolution tricks that you can do in real time, your primary display options are mainly centered on sampling to produce a full-frame display at an effective resolution of 256 x 256.

If more memory is available, you can sample the picture at a higher resolution than the display, but it takes quite a bit more memory to be truly useful. Doubling your resolution to 512 x 512 in RAM requires four times the memory since you must double the original 32K just to get twice as many pixels/line and then double that to get the 512 lines! This means that the RAM required for image storage would be 128K (4 x 32K), and you cannot do this with a computer with only 128K of RAM available—some of the computer memory has to be allocated to software, variable storage, and other aspects of the operating system.

If you have a 128K system, it hardly pays to increase just the pixel or line count—you would be

Photo B. A medium-resolution quad from a METEOR 2-15 pass. The area covered here is about 1/4 of the full frame with an effective resolution of 512 x 512. Lake Superior lies along the lower left of the image.

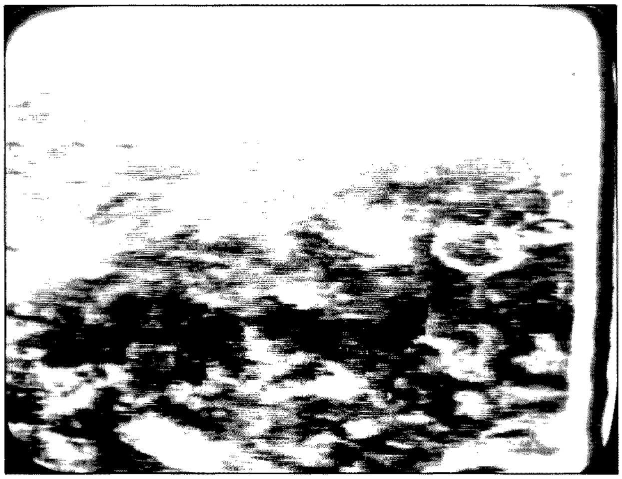


Photo C. A high-resolution quadrant from the METEOR pass in Photo A. The white circle at the right is Lake Manicouagan (1,024 x 768 effective resolution).

better off to use the additional memory to store more pictures or store 6- or 8-bit pixel data to give yourself options for image-contrast processing. I will talk more about that in future columns.

If you have a lot of available RAM (256K or more), then you are in a position to store far more detailed images than the display can handle. With such a high-resolution image in memory, you can sample the stored image to create your basic full-frame image on the 256 x 256 display or you can display selected quadrants of the image in memory to get the advantages of higher resolution. The display is still 256 x 256, but you can use this display as a "window" to achieve higher effective resolution at the expense of the area of image covered by the display. I will show you some actual examples of this before I quit for this month.

The CoCo—A Good Choice

Although the display doesn't care what kind of computer it is connected to, for the *WSH* project I chose the Radio Shack Color Computer (CoCo). There were lots of reasons for that choice. They include low cost, long-term support from the manufacturer, a good history of retaining compatibility as models are upgraded, and inexpensive and readily available assembly-language programming tools.

Additionally, the CoCo has a tremendous range of I/O resources that come as standard equipment. The joystick ports can be programmed to provide the needed A/D conversion of the video signal, eliminating the need for a hardware A/D. The I/O capability of the serial and cassette ports provides all the other major control and status I/O, and the data bus is accessible through the cartridge port.

Using the CoCo, you need only a single chip for the interface to the computer. Interfacing to any other computer is not a monumental task, but it *is* more complicated. In fact, the *WSH* has a far more complicated interface for the CoCo than is actually required, but that approach was taken to provide a thorough tutorial for those insisting on interfacing to other computers!

Aside from the "What is the *WSH* scan converter?" questions, number two in popularity is "I want to use my PC for the scan converter. How do I do it?" Actually, for a PC, you can substitute the name of almost any computer—if it has been out there on the market, I have been asked about it!

Well, folks, I'll let you in on a secret. I have a PC in the satellite station, but I never gave more than a passing thought to using it for scan conversion. The reason is twofold—conflict and cost. The PC is a real workhorse, doing a wide variety of jobs from word processing to CAD. That's the real problem with it. There are innumerable applications programs for the machine and too many ways to use it already.

Once you begin to scan-convert pictures, particularly if you hook into the hundreds of pictures each day on WEFAX, you are going to want to watch pictures. The last thing you need is to have to decide if you want to unhook the scan converter so you can do some writing or work RTTY. If the PC were the center of the display system, I would soon be justifying another one just to avoid the conflicts. There are jobs the PC can do that other less capable systems just can't, but scan conversion isn't one of them.

For $100 to $300, depending upon the model, you can buy a CoCo and dedicate it to the job of making satellite pictures. That is about on par with what you would expect to spend on I/O boards for the PC, but now there is no conflict. If you want to use a PC or any other mid- to high-end computer, be my guest. It will work fine, providing someone will write the software, but you will have a $100 saddle on a $10 horse.

One seeming advantage of a PC is the fact that you can save pictures to disk. About ten 32K images will fit on a standard PC disk, but *each* high-resolution picture (discussed below) requires more storage than is available on a standard floppy. You could cram two or three of them on an AT disk, but that kind of system is really beginning to escalate in the cost department! An inexpensive CoCo with pictures stored on old-fashioned audio tape begins to look pretty attractive!

Available CoCo Software

Three versions of software are presently available for the CoCo, depending upon the model you have. The CoCo 1/2 program is available on cassette and supports the CoCo models 1 and 2. This program displays full-frame images in the 256 x 256 format and includes automatic WEFAX and manual NOAA APT, 240- and 120-lpm displays, plus inversion and complementing of displayed images, grayscale, etc.

The CoCo 3/128 program is designed for the 128K CoCo 3 and has basically the same features as the previous program with the added benefit that images can be saved in digital form on cassette.

The CoCo 3/512 program for the CoCo 3 with 512K of RAM is the real powerhouse of the trio. While the previous programs are limited to sampling pictures to match the display format, the 512K version samples 1,024 pixels/line and 768 lines—essentially full resolution. This image in memory is sampled to provide the default full-frame display, and the results look identical to those obtained with the previous programs.

Once a picture is in memory, however, there are two additional display modes. The medium-resolution option lets you look at any 1/4 quadrant of the image (there are nine that overlap) with an effective resolution of 512 x 512. From any medium-resolution quad, you can select any one of nine possible high-resolution quads, each producing an effective resolution of 1,024 x 768! You can shift freely from one mode to the other and examine any parts of the picture down to a level that is equivalent to a good FAX system!

Both the CoCo 3/128 and 3/512 programs are available on EPROM and both programs are included. No matter which model you start with, your software acquisitions are complete!

So that is the *WSH* scan con-

verter. You will see lots of examples from it in future columns (not to mention this month!). It provides a heck of a lot of display power for very modest bucks and offers plenty of flexibility for trying new tricks—some of which I will cover in upcoming months.

Pictures of the Month

This month I am doing pictures because the completion of testing for the CoCo 3/512 program coincided with the launch of a new Soviet METEOR spacecraft, providing a marvelous change of pace from the WEFAX schedule! METEOR 2-15 was launched on January 5, 1987, and as this is being written (early February) the spacecraft is providing superb imagery, passing overhead near noon each day with transmissions on 137.85 MHz.

Sun angles are perfect and all of the Midwestern and East Coast snow provides excellent potential for recognition of ground features. All in all, it's a very good chance to show what the *WSH* scan converter can do with polar imagery.

By way of background, all the pictures were received using the *WSH* "Zapper" omnidirectional antenna, the Hamtronics GaAsFET preamp reviewed in an earlier column, and a Regency MX-5000 scanner receiver. All pictures were automatically tape-recorded using the system to be described in next month's column.

Photo A shows the default full-frame display of a METEOR 2-15 pass that would be obtained with any CoCo model using the 120-lpm mode. Michigan and the Great Lakes are near the center of the image, the East Coast is angling upward in the lower right, and most of the upper half of the picture shows Ontario and Quebec. Lake Michigan is almost cloud-free, a bit of southern Lake Huron shows through, while Superior, Erie, and Ontario are socked in!

Note the clouds following the East Coast approximately 100 miles offshore. The St. Lawrence River/Seaway (ice- and snow-covered) shows as an angled white streak near the right edge about halfway up. Right on the edge of the display above the St. Lawrence is a little white circle—our old friend Lake Manicouagan that we will look at more closely in a moment.

If this were all the *WSH* system could do, most folks would be quite happy. If you have a 512K CoCo, however, the fun is just beginning!

Photo B shows a medium-resolution quad from a METEOR 2-15 pass the day prior to the one in Photo A. The area covered here is about 1/4 of the full frame with an effective resolution of 512 x 512. Lake Superior, with a pretty cloud plume across its center, lies along the lower left of the image.

Note the band of heavy lake-effect snow along the north shore of the lake, extending east to the west shore of Thunder Bay. The pronounced white ellipse north of the lake is ice- and snow-covered Lake Nipagon. James Bay and the southernmost portions of Hudson's Bay are hanging in on the upper right.

"If you want to use a PC or any other mid- to high-end computer, be my guest."

Any portion of the full frame can be examined at this resolution or you can flip back to the full-frame format in a moment. The party is not over yet for there is still one more resolution level available.

Photo C shows a high-resolution quadrant (about 1/4 of a medium-resolution quad or 1/16 of the full-frame image) from the METEOR pass in Photo A. The white circle at the right is Lake Manicouagan in high resolution (1,024 x 768 effective resolution).

There was a VHRR image of the lake in the January column. You might find it interesting to get out a magnifying glass and compare this image with the one from January. Virtually all of the tributary embayments around the lake that are visible in the VHRR shot are also seen here, including the hook-shaped internal embayment on the right side. Remember that this feature is about 45 miles across!

If you have the January VHRR shot in front of you, follow down and to the left of the lake and you will see three parallel white arcs. These represent three strips of forest clear-cutting. Now move to the left of the lake in this month's image, almost to the left edge of the display. The two clear-cut strips that are quite close to one another appear as one broad arc, primarily due to a small patch of overlying cloud cover, but the third strip is clearly resolved.

By the way, the vertical black stripe at the far right, flanked by two white stripes, is part of the alternating 13 white and 13 black stripes that make up the METEOR audible line sync pulse.

This is not HRPT, but I think most of you will not argue that it is a display system worthy of serious consideration—even if it does use *only* a CoCo! In future columns, I will be showing you still other things that you can do with the system—as if this were not enough!

Next month I will discuss some approaches to automatic taping of satellite signals so you can get pictures like these while earning enough to convince the spouse that you really can afford some new weather satellite hardware. ■

ATV

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PO Box H
Lowden IA 52255

CHEAP AND EASY FSTV

I have been promising to show you a way to get on FSTV receive for just a few dollars so you can tune and watch all the local action. This month's column fulfills that promise.

Some of the newer TV sets with individual thumbwheel setting TV channel tuners will indeed go down into the ATV band around 439 MHz. My wife, Rose KA0SUT, recently gave me a little Emerson "mini-TV" (1.5-inch B/W screen). Henry Ruh KB9FO was down for the weekend (eating all my birthday cake) and immediately, to my wife's surprise, removed the set from its case, located the UHF TV tuner, put a signal on the air at 439.25 MHz, and tweaked it ever so slightly. Now when I tune up on UHF at the bottom end of channel 14, I can see my direct picture.

We put it on my four-by-48-element Jaybeam antenna system (hardline and mast-mounted preamp, of course) and received KA0BVT 25 miles away at near close-circuit WITH NO DOWNCONVERTER! The problem in doing that, though, is that TV sets were not designed to go down into that part of the world, and they start falling off in sensitivity dramatically (or they physically just won't go any lower in frequency).

Eventually you will need the help of a downconverter. P.C. Electronics will have reduced specials on ATV downconverters this year at Dayton (or by mail order). Wyman Research in Waldron, Indiana, also has some economically priced ATV downconverter "kits" (contact W9NTP).

What about a little gadget that perhaps is not quite as sensitive on receive (preamps are easy to build or cheap to buy) but that tunes both the ATV and the commercial UHF TV band in one sweep? Interested? Read on!

The March/April 1985 issue of *The Spec-Com Journal* ran an article by Dr. Clyde Miller WB4AOH on using surplus UHF TV tuners padded down to receive ATV frequencies. He used a Radio Shack Mitsumi UES-A56F UHF-TV tuner (catalog #277-220). These neat little devices sat around for a few years at $24.95; but in 1985, the decision was made to close them out.

ATV operators caught wind of it and gobbled a lot of them up for $4 to $7 each, so it is doubtful if you could find them today, except maybe at hamfests. (You might also look around in a Radio Shack surplus barrel or have the store manager call Ft. Worth to see if there is any stock left in the warehouse that can be special-ordered.) Other similar devices are available, however, through parts specialty houses for about $12 to $15. They may have other than Mitsumi factory names, but generally they are all pretty much the same.

The device fits in the palm of your hand, is nearly square, and comes in a shiny chrome-like casing. It has ten or more pins sticking out one side to be connected into the TV set, one or two pins out the other side for AFC, and a male RCA jack for a UHF TV antenna input. A few resistors and a couple

of capacitors, along with a 5k pot that would vary the dc voltage (.9 V dc was 430 MHz), is usually all that is needed to get it going.

One advantage of this device over a fixed downconverter is that you can tune the ATV band and then slide on up through the commercial UHF TV channels (420–884 MHz) as well. Once built and preamped, the device made a good ATV receiver that could fit inside a home-brew transceiver cabinet. Dale WA4BDX of Shelby, North Carolina, won first place in the Charlotte, North Carolina, "A5" Hamfest get-together in March of 1983 using this UHF-TV tuner device in his ATV rig (see Photo A).

Write to Dr. Clyde WB4AOH at 3701 Frederica Street, Owensboro KY 42301 for more details. Ask him to send you a photocopy of the W4LUB Skeleton Slot UHF Antenna as well. Include a buck or two for his time and trouble and an SASE or return postage.

Long-Distance Fast-Scan TV

Some of you have remarked that you were amazed that fast-scan TV signals could travel so far when band conditions were good. In March, I mentioned the great Thanksgiving weekend contact between Paul Nees KØIWA in Burlington, Iowa, and Ed W3POS in Erie, Pennsylvania (578 miles). That, as far as I've heard, is the #1 USA FSTV DX land-distance record.

It is not all that hard to break, as during that opening it was just a matter of getting people on the air to accomplish the contact. Maybe some of you old-timers have indeed worked two-way FSTV contacts much farther than that. We'd like to hear from you. Include specifics such as callsigns, distances worked, P-signal reports, dates, etc.

Spec-Com Journal has already published ATV's first official DX Award Roster and continues to assemble new contacts for publication. To get on the honor roll, submit your best two-way contacts over 200 miles. Leading the pack is a land/water contact between Floridian WA4GRK and Texan W5VDS held on May 30, 1986, with an average P2 picture some 937 miles. It will be hard to surpass that accomplishment. Red and Frank used 100-Watt amplifiers and modest horizontally polarized beam antenna systems. Contrary to old thought, most of the country is horizontal for better, lower noise level, simplex action.

Photo A. Dale WA4BDX of Shelby, North Carolina, and his award-winning UHF-TV tuner for ATV.

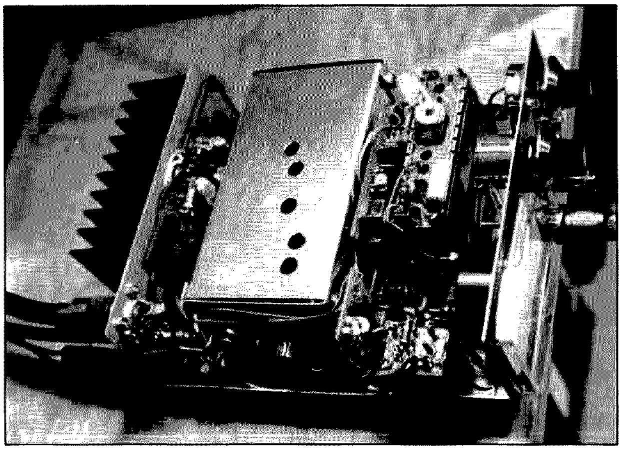


Photo B. W4TOY's home-brew ATV transceiver using the UES-A56F TV tuner.

By the way, there are now 13 ATV repeater or remote transmitter systems in the country using this DX antenna field as well. The conversion list is growing as ATV groups are learning by others' examples that you CAN have your cake (DX) and eat it (omnidirectional repeaters) too!

Several Midwestern and East Coast ATV repeater groups are giving second thought to returning to the H-plane antenna radiation patterns so as not to miss out on these terrific DX band enhancements—20-dB loss on being cross-polarized is hard to overcome, although not impossible. Tracy Monson N9AEP in Moline, Indiana, and Don Miller W9NTP in Waldron both saw or got into one of the Pittsburgh vertical repeater systems that Thanksgiving weekend, although it was reported that no one was around to take advantage of it.

"Put up the highest stacked multi-element, hardline-fed, mast-mounted-preamplified antenna system that your pocketbook can afford and you'll be surprised at just how far UHF fast-scan TV will travel."

Put up the highest stacked multi-element, hardline-fed, mast-mounted-preamplified antenna system that your pocketbook can afford and you'll be surprised at just how far UHF fast-scan TV will travel. Unless you have a mountain in front of you, you can go hundreds of miles. Fast-scan TV is usually thought of as a line-of-sight communications mode. They wrote the test on that theory too many years ago, before radio amateurs got permission to operate the band . . .

Finding Local Activity

The mail I am getting from readers is unexpectedly heavy! My secretary Patti and I are trying to answer all of it as it comes in and fill your requests at once. My apologies if I don't get back to you quickly on personal questions.

Most mail has been of the "inquiring about activity in my area" type. Might I suggest an invaluable beginning locator that will become a useful addition to your technical library? The *USATVS North American ATV Directory* ($6.95 ppd. from the address at the beginning of this column) lists more than 110 ARRL and USATVS registered ATV repeater and remote transmitter systems in the U.S. and Canada, including the input/output frequencies they operate on, who sponsors them, and other such information.

It contains an up-to-date ATV club or organized group directory, showing more than 70 American fast-scan TV clubs, when they meet, what frequency they hang out on, and how best to contact them. Also, there is a large, full-page map of the U.S. that depicts 2-meter VHF frequencies and UHF antenna polarizations used by the ATV gang across the country. More than 1,000 registered USATVS members are listed, along with dozens of neat "in-shack" operator photos. It also includes my first three ATV columns on the basics of getting started on ATV.

Dayton ATV Workshops

I'd like to remind you of the ATV workshop sessions that will be held this year at The Ramada North, 4079 Little York Road, in Dayton, 1/2 mile south of I-70 and I-75. (Last month, the wrong motel was mentioned as the ATV meeting place.) Come on over to our suite Friday night and/or Saturday afternoon/evening and talk ATV and bring your VHS videotapes of local ATV activity and photos of DX contacts!

Formal programs will be conducted at 7 p.m. each night, with John Beanland G3BVU/W1 from Spectrum International being the featured speaker on Saturday night. I'm hoping that we'll be on the air through the Dayton W8BI (vertical) ATV repeater system (or on simplex) at 439.25 MHz; 147.450 simplex is the place to monitor on 2-meter FM.

Yes, there will be ATV mobiles floating around. I might be riding over with Henry KB9FO in his Bronco with 100 Watts and horizontal polarization for the trip. Once we get out of Chicago, we should be able to see some FSTV signals (there aren't any to watch in the Windy City anymore).

Look out Findlay or Indy Group; we will be passing through on Thursday on 144.340! See you at W6ORG's Saturday afternoon ATV meeting, too. ■

73 INTERNATIONAL

NOTES FROM FN42

73 International welcomes Chang Han Dong of Shanghai as our latest foreign correspondent. The People's Republic of China is certainly the largest nation now represented here, in terms both of people (1,034,907,000—1984 estimate) and size (3,691,521 square miles), and Shanghai is the largest city. It is not difficult to predict that the nation will show tremendous growth in the ham radio field (perhaps the greatest percentage of growth by any nation) in the coming 13 years. We hope the courtesy subscription to *73 Amateur Radio* that we send to new correspondents will help that growth. We think it will do more than another new export, anyway: the China Central Television network has announced that it will be importing *Marcus Welby, M.D., Family Affair, Columbo,* and *Star Trek* for regular prime-time showing. Read this column's China news in the May, 2000, edition of *73* to find out which shows the greatest rate of growth, hams or the nation's estimated 400 million TV viewers! It should be interesting!

May 10 is Mothers Day—Dia de las Madres, Fete des Meres, and Muttertag—except in the Central African Republic, where it is on May 28; it is Constitution Day in Japan (3rd) and Norway (17th), National Day in Cameroon (20th) and Tanzania (26th). May 13th is Joan of Arc day in France, the 16th is Discovery Day for the Cayman Islands, and it is Victoria Day in Canada on May 18. On the 14th, it is Independence Day in Israel, in Paraguay on the 15th, and for the Hashemite Kingdom of Jordan it is on the 25th, so send greetings to King Hussein I (Alhussein Ibn Talal JY1), Queen Noor Alhussein JY1NH, and especially to Her Royal Highness Princess Raya JY2RBH, who will be celebrating her first birthday.

ROUNDUP

Brazil. Don't forget World Telecommunications Day, and the XVIII ITU Contest, sponsored by LABRA (Liga de Amadores Brasileiros de Radio Emissao), 0000 UTC, Saturday, May 16 to 2400 UTC, Sunday, May 17. The object is for amateurs around the world to contact other amateurs in as many different ITU zones as possible, in order to enable their country to win the ITU Plaque, which remains with the country. Only on the 160-, 80-, 40-, 20-, 15-, and 10-meter bands. Details from your local club.

Czechoslovakia via Canada. Marvin Hlavac OK3CAW of Edmonton writes of the OK3KII radio club he "grew up in" in Bratislava (see photo). With their location on a hill, with monoband yagis for 14, 21, and 28 MHz and wire antennas for the low bands, they made about 50,000 QSOs during 1984 and 1985, more than half of them with the USA. Laco OK3CEI is the chief operator; others include Roman OK3CDV, Miro OK3CTM, Priemisel OK3CVM, Juraj OK3CNJ, Ivan OK3UQ, Victor OK3CLI, and Richard OL8CTA (junior op callsign).

WHAT HATH GOD WROUGHT?

On the 24th of this month, hams should celebrate a 143rd anniversary. On May 24, 1844, Sam Morse ended years of living hand-to-mouth on his income as an artist, reaching a payoff to his experiments with the new-fangled notion that electricity traveled along wires. He sent the world's first telegraph message along 40 miles of wire between Baltimore and Washington. His words: "What hath God wrought?"

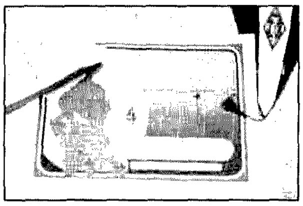
The effects on the world were not exactly instantaneous. Ten years later, Senator Gwin (California) was still trying, unsuccessfully, to convince the U.S. Congress of the marvelous communications potential of the Pony Express. Private enterprise came through, however, and in 1860, the country marveled at the speed with which Lincoln's inaugural address reached all the way from Mississippi to California. Relays of horses got it there in only seven days and seven hours.

The Pony Express headed for the history books a year later. Telegraphy finally triumphed with the 1861 opening of a 3,595-mile cable between New York and San Francisco.

Greece via New York. The Hellenic Amateur Radio Association (HARA) was founded in New York about a year ago, for the purpose of promoting amateur radio among the Greeks living in the United States—and to improve communication among them. For more information, write HARA, PO Box 657, Fresh Meadows NY 11365.

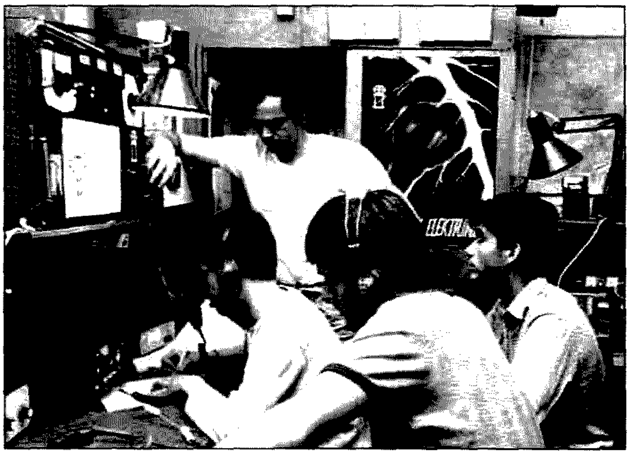
Italy. George A. Lucchi W6NVN, a ham for 51 years, had a QSO with well-known Tony Ceccoli T77C in Northern Italy, and two weeks later hand-delivered his QSL card. (See photos.) George was on a trip to visit relatives in San Marino. Now *that's* the way to improve communications between countries!

The Varese Chapter of the Associazione Radioamatori Italiano (ARI) has created the "Varese–The Province of the Seven Lakes" worldwide ham and SWL award for the 1.8 to 144 MHz bands, CW,

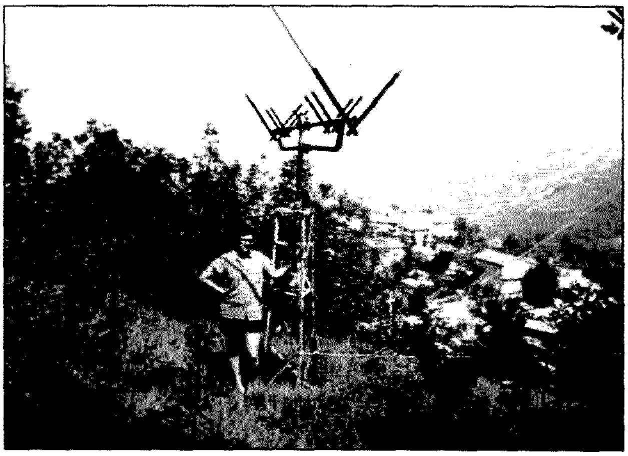


The Varese–"Province of the Seven Lakes" Award.

T77C (left) and W6NVN.

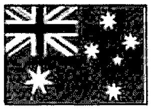


L to R, Roman OK3CDV, Miro OK3CTM, Laco OK3CEI, and Ivan Lobik.



T77C and his inverted V.

SSB, RTTY, for contacts made on and after January 1, 1985. No repeater contacts; dupes are valid providing mode and date are changed. Valid contacts are those made with members of the Varese ARI Chapter "that in addition to the report will furnish a progressive number." For HF: European stations will need 15 contacts plus 5 contacts (or stations heard) of stations sited on lakes shore; stations outside of Europe: 5 contacts plus 3 contacts (or stations heard) of lakes shore sited stations. For VHF: 30 contacts plus 5 contacts of stations sited on lakes shore. Requests, with 10 IRCs or the equivalent in Lire, to: ARI Varese, POB 26, 21100 Varese, Italy.



AUSTRALIA

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Australia

VK8—THE TERRITORIANS

The Northern Territory covers an area of 519,788 square miles, with its two main cities, Alice Springs and Darwin, being 1,000 miles apart. Much of this "outback" area has still to feel the touch of civilization.

Alice Springs. Immortalized by Nevil Shute's novel, *A Town Like Alice*, as well as by the film of the same name, is not the frontier town that it was 40 years ago. Today "The Alice," as it is known to most Australians, is the stopping-over point for countless thousands of tourists (particularly Americans and Japanese) wanting to see our "Red Centre," with the main attraction being Ayres Rock.

This area is steeped in history regarding old-time radio and telegraph, with the old overland telegraph station a place to visit. Here you can see depicted in photos the hardships that those hardy men and women went through to build a telegraph line from Adelaide, at the bottom of Australia, to Darwin, at the top. It had to go through 2,000 miles of the harshest dry, desolate conditions that can be faced anywhere.

The grave of the founder of the Flying Doctor Service, The Reverend John Flynn, is located at The Alice. The Rev. John, being an amateur, was made a member of the WIA in 1925. He was responsible for enlisting the aid of Alf Traeger VK5AX/VK8XT in developing the famous pedal radio, with the first successful on-air experiment being conducted between a nursing home in The Alice to Hermannsburg Mission, about 100 miles west of The Alice.

To prove that the transmission worked, the story goes that The Rev. John and Alf drove into the Queensland city of Cloncurry in early November of 1928 on Melbourne Cup Day to publicize a better model of their innovation. The ideal place to set up was in front of the local hotel, and, as a local horse was running in the Melbourne Cup, a crowd soon gathered to see if the results of the race could be obtained quickly. A transmission of over 2,500 miles was heard, the local horse won, and when the crowd that had gathered adjourned to celebrate, the two men were left with the set knowing that they had succeeded in their venture.

Amateur Radio Today. The Alice Springs Amateur Radio Club has approximately 25 active members and claims to have the highest membership-per-head of total population of any place in Australia. Of the 25, eight have satellite capabilities. When AO-10 was in prime operating position, as many as six could be on at the same time.

Alice Springs amateurs supply communications for the annual Camel Cup Race, a nostalgic reminder of the time when we had Afghan camel drivers with up to 900 camels in the camel train which carried most of the goods into and out of the vast center of Australia. This was before the advent of the Ghan Train (named after them) from Adelaide to The Alice, which put them out of business.

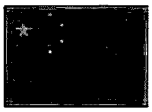
Another attraction at The Alice is the annual Henley-on-Todd boat race. This race is held "in" the Todd River, which is dry for years on end. The boats consist of light bottomless canvas-wrapped frames; the propulsion is six or eight people who have pulled the boats up around their waists. Representing various charities or other organizations, the teams run like mad down the dry river bed to the cheers of locals and tourists who line the bank of the river, many with an 807 in one hand and a barbecued chop or sausage in the other.

Most radio traffic is via the local 2-meter repeater. (For those thinking of taking a radio on their trip to VK8, this has just had a frequency shift to 146.350 in and 146.950 out.) A high percentage of The Alice amateurs concentrate on the higher bands, with 6 meters being very active during the last year or so, so it is not surprising that HF contacts are few and far between.

Under the editorship of Jeff Tong VK8TJ, the first club news sheet, *The Centre Conductor*, has just been published by the ASARC. In this issue, he states that plans are under way for the construction of a fully steerable 9-meter parabolic dish for use with upcoming satellites and moonbounce work.

Packet Radio. Packet radio was inaugurated in Alice Springs on May 14, 1986, when VK8RP and VK8TJ established a link using a TAPR TNC-2 and a PK-64. Quickly to follow on-line were VK8s TM, BB, and ZND, also using PK-64 TNCs. The protocol chosen by The Alice amateurs for the local standard is AX.25 level 2 version 2, in order to conform to the Region 3 designated standard, as well as to have compatibility with the upcoming amateur satellite capabilities of JAS-1 and AMSAT 111-C.

As all of the amateurs now on packet in Alice Springs are also active on OSCAR, the network will be able to extend beyond its physical isolation. If you are interested in trying out an OSCAR packet link with The Alice or if you have any information to contribute, the group will be very pleased to hear from you. Write Rick VK8RP, 44 Memorial Avenue, Alice Springs, N.T., 5750, Australia.



PEOPLE'S REPUBLIC OF CHINA

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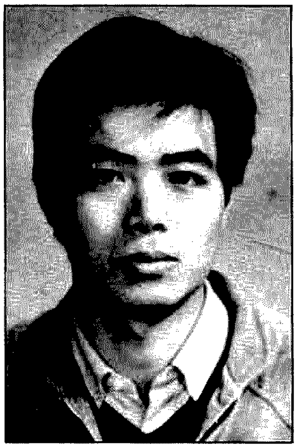
Shanghai 200062
China

Becoming A Ham. In 1982, the first amateur station, BY1PK, was set up in Peking, P.R.C. (People's Republic of China). It was a very important year for Chinese amateurs and me. At that time, I was a student in Shanghai JiaoTong University (SJTU).

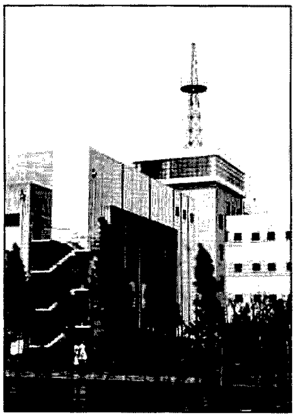


Chang Han Dong.

Prior to 1982, as was true of other Chinese young people, I knew nothing about amateur radio communication. Before 1949 there were some amateur stations in China, but amateur radio was called off from then on.

When BY1PK was set up, there were several magazine articles as a result, about amateur radio communication, one after another. They exerted a great influence on me. I got to know elementary knowledge about an amateur station from these articles, and was interested in becoming a ham. Before long, an amateur station was set up in Shanghai (my city). I was very happy then. In 1985, Shanghai's second amateur station was set up, too. It's callsign is BY4AOM.

There are no private amateur stations in China, so I have joined a collective station; now I am a member of BY4AOM. This is an outstanding amateur station: "AOM" means "Able Old Men." There are about 20 members, and the average age is about 65. They often work from morning till deep night, even to the morning as



East China Normal University.

Peking	BY1PK, BY1QH
Shanghai	BY4AA, BY4AOM
FuZou	BY5QA, BY5GA
XinJiang	BY0AA
ChenDu	BY8AA
NanKing	BY4NA
HangZou	BY5HZ
SuZou	BY4SZ

Table 1. Amateur stations in China.

young men do. They are *really* A O M!

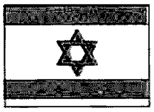
It is common knowledge that China is a developing country, and its electronic industry is also developing. Therefore, we are not able to buy station equipment for amateur radio and must make it up by ourselves. We made a receiver, antenna, and so on. Besides, we have two transceivers, one a secondhand rig; they were a present to us from our friends living abroad. On Sundays I often go to the station to operate with my friends. We go there by bus or by bike, and it takes a lot of time, about one and one half hours.

In order to help more and more people to understand amateur radio, we conducted a training course for secondary school students. The content included elementary knowledge of amateur radio, English, making a radio receiver, and operating a station: CW, SSB, etc. In addition, we are going to set up an amateur station network in Shanghai and another station, BY4AY, specially for young men. [AY *must* mean "Able Youth"!—Ed.] We are going to design a kind of receiver that is not expensive, but is easy to be made and to be used by the beginner.

Since 1982, 17 amateur stations have been set up in China (P.R.C.). They are distributed mainly in Peking, Shanghai, and FuZou regions. (See Table 1.) They are permitted to operate on all amateur bands. Usually they are worked in CW and SSB. The Shanghai station also works SSTV, ATV, and OSCAR satellite.

Now there are some hundreds of amateurs joining in the activity—secondary school students and elementary school students; others are teachers, workers, army men, students in university, and so on. Great advances have been made in amateur radio of China, and more and more stations will be set up as amateurs apply their minds and learning to the work.

I hope to make more new friends in 1987 and exchange experiences with others.



ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
85 530, Negev MPO
Israel

The Annual Israel Amateur Radio Club social evening (last December) in Tel Aviv was the biggest yet, with 650 attending. Doubtlessly more than partly responsible was a raffle that radio clubs the world over could be proud of. For two months, members of a small dedicated group of hams had been making pests of themselves going around to ham-involved businesses and others, and made sure that word leaked out about their successes. Nearly 200 prizes were raffled off: station accessories, computing gear, textiles, artifacts, electronic equipment, a year's towing service, and the grand prize, a round-trip to London with two weeks accommodation! Ticket sales for the drawings were overwhelming, and the IARC treasury became richer by a few thousand shekels—which will guarantee better IARC membership services in 1987.

There were exhibitor's stands in the lobby of the Bessarabia House showing the latest gear, and a demonstration of three packet stations. This was a hit, showing how messages were moved at the lightning speed of 1200 baud, and how the station in the middle set itself up as a digipeater, relaying messages, untouched by human hands.

Packet in Israel. This exciting new mode is catching on by leaps and bounds, and is so hard to keep track of that by the time you read this it doubtless will be out of date. We are still in the infancy stage, but an explosion is just around the corner. As of now (January) there are 20 stations equipped with packet and at least twice that number contemplated for the immediate future. Although masses of amateurs here still think of packet as just a glorified form of RTTY, it's only a matter of time before they see what this actually is, get envious of their friends, and make the small extra investment necessary.

Look for Israeli stations between 14.105 and 14.108. 4Z4ZB in Jerusalem leaves his TNC on 14.1075 MHz all day Friday so he can be contacted or used as a relay, and the rest of the week it's on VHF, serving as a digipeater on 144.675 MHz, the Region One IARU Packet Channel. 4X6OJ is active with bulletin board on HF, and is working on an input/output that will be linked to VHF. The IARY has authorized two digipeaters, with other private stations already serving this purpose on 145.675 MHz. Country-wide hookup is already a reality, and soon, if conditions permit, you should be able to contact an Israeli packeteer on HF, be linked into local VHF, and make instant contact with any Israeli packet station. The possibilities are mind-boggling, and it doubtlessly will be amusing in a few years to look back and read what's written here today.

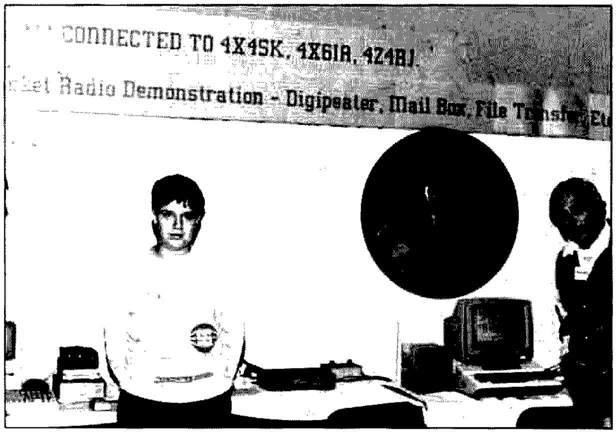
Easier Reciprocal License. I wrote earlier that you had to appear in person to get your reciprocal license when visiting here. Now you can save precious time by writing several months before you come to Ahron Kirschner 4X4AT, IARC, Box 4099, 61 040 Tel Aviv, Israel, and request the Ministry of Communications form to fill out. Return this completed form along with a photocopy of your license, callsign, and list of equipment you plan to bring, and the IARU will deal with the red tape and send you the reciprocal license (provided, of course, you are a national of a country Israel has a reciprocal agreement with, namely, Australia, Austria, Canada, Chile, Costa Rica, Holland, Luxembourg, Sweden, Switzerland, the UK, United States, Uruguay and West Germany).

Private Lines. In order to eliminate unwanted interference and occasional intermod, the Haifa repeater on 145.625 needs a 192.8-Hz subaudible tone tagged to your signal to access it. The Jerusalem repeater on 145.625 will have followed suit by the time you read this. This one tone will be universal for all of our repeaters. A Haifa amateur has devised a simple tone generator built around a DTMF chip and a 455-kHz miniature i-f crystal filter that is added easily to all rigs. So don't forget to have a PL generator on your 2-meter rig before you get here; and it also will be fun to bring some packet equipment. Then, if you have any room left in your suitcase, bring along some clothes!

Mailbox on Mt. Carmel. The W4FQM/4X RTTY repeater on Mt. Carmel, near Haifa, has recently received a new addition: a mailbox given by the donor of the repeater, Ed Webb W4FQM. The unit is an Info-Tech M-700A with 64K memory, 48 for the mailbox and 16 for bulletins, one of the most popular of which is 4X4FU's *DX Bulletin*, which he updates several times a week.

By accessing the machine and entering the right request, you can see printed out on the screen instructions on how to make full use of all of the repeater's facilities, and also how to link up the Haifa FM repeater on R0 with the Upper Galilee machine on R3.

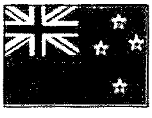
At all times of the night and day you can hear the teletype tones when your rig's scanner stops at 145.300 MHz. Just a year and a



Three packet stations demonstrating digipeater, mailbox, and file transfer operations at the annual IARC social evening: 4Z9CBD (left) and 4Z4RJ.

half ago when Ed sent the RTTY repeater over this way, you wouldn't have imagined that digital communications could catch on so fast. I, for one, couldn't imagine what you would need a RTTY repeater for on 2 meters, but now, with the addition of the mailbox and its manifold uses, I see how nearsighted I really was! Digital and space communications are no longer modes of the future; they are here and now.

Next time: 4Z4ZB's first Israel-to-space two-way amateur OSO, the resultant publicity, and the mail response to the IARC.



NEW ZEALAND

D.J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

NZART CONFERENCE IN MAY

If you are in New Zealand this month, the annual NZART Conference will be held over the weekend of May 30 to June 1 at Wanganui, on the west coast of North Island about 200 miles north of Wellington. If interested, contact the Conference Secretary, PO Box 7058, St. Johns, Wanganui.

WARO SILVER ANNIVERSARY

March marked the 25th anniversary of the NZ WARO, the Women's Amateur Radio Operators Club in New Zealand, which was formed at the 35th NZART conference in 1961 when Thelma Souper ZL2JO (now a Silent Key) suggested a ZL-YL club to a small group of YL operators.

The idea was met with enthusiasm, national YL nets were begun on July 11, 1961, and with the addition of separate nets for the North and South Islands and CW, they have continued each month to the present. As many ZL-YL operators as possible were contacted, and the inaugural meeting was held March 10, 1962, at Brents Hotel in Rotorua, with pledge of support received from those unable to be there in person. ZL1s present were Florence Voss AXP, Judith Holland AWM, Celia Reed ALK, Janette Barker ANA, Vicki Shaw OC, Enid Rosen, and, of course, ZL2JO.

WARO was honored to have amongst the foundation members a few YLs who, like ZL2JO, had been on the air since the early 30s. Notable was Myrtle Earland ZL4GR, New Zealand's first licensed YL operator (OZ3AG), now a Silent Key, who was a lady of renown and active in amateur radio for over 50 years, and the recipient of the first special WARO Award in 1980 "to the Grand YL of ZL Amateur Radio."

The WARO's objective is "to promote and encourage friendship and interest in radio amongst Women Radio Amateurs." This aim has been fulfilled, since the present day membership is composed of 121 ZL members, 37 associate members, and 60 DX members, for a total of 218. These figures mirror a steady gain that is still continuing, as well as worldwide recognition. The first overseas member was Mildred K9HRH, a Silent Key now since 1969.

In 1969, the WARO Award was introduced. The attractive certificate features "Pania of the Reef," with seals added for extra YL contacts after the basic award (see "Pania of the Reef Award" sidebar). Pania is a young Maori maiden in a legend. Lured by the siren voices of the Sea People, she swam out to meet them, and when she endeavored to return to her lover, she was transformed into the reef which lies beyond the breakwater at Napier and bears her name.

Besides the WARO Award, WARO organizes an annual 80-meter contest for the Thelma Souper Memorial Trophy, in April. This is open to OMs as well as YLs, with the former competing for certificates; the trophy goes to the WARO member with the highest score.

In 1981, WARO adopted a flower emblem and included it in a badge now worn by members (see Fig. 1). It is "the Mt. Cook lily"—which really is the giant mountain buttercup *(Ranunculus Lyallii)*. It grows up to three feet tall, with leaves that are bowl-shaped to hold rain or mountain dew, with flowers about 2-1/2" in diameter. It also has its own callsign, ZL2YL, used on special occasions, such as during the March Jubilee Award.

If you are interested in WARO or the awards, write the president, Jeanne Gilcrest ZL2BOD, 20 Vogel Street, Hawera, New Zealand, or the secretary, Anne McMaster ZL3VR, Greens Road, R.D.1, Kaiapoi, South Island, N.Z.■

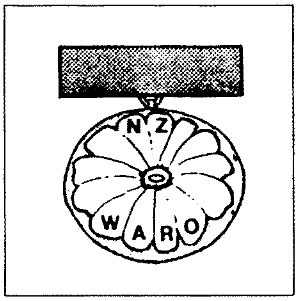


Fig. 1. The WARO badge.

PANIA OF THE REEF AWARD

All contacts, any mode, any band, except WARO Net contacts or contest contacts are eligible. QSLs not required; send certified list to Award Custodian, Vicki Shaw ZL1OC, PO Box 2088, Whakatane, N.Z., with sufficient IRCs for mailing you the certificate.

DX stations work six resident ZL WARO members from June 1, 1969, to date; VK and ZL work 12 resident members. Endorsement seals available for each six additional contacts (DX) or 12 contacts (VK, ZL), with contacts with overseas members of WARO eligible for counting towards seals AFTER having logged at least three ZL contacts, for each endorsement.

DX listeners must list 10 contacts heard with WARO members since January 1, 1979. List full log details with callsigns of both stations concerned. Endorsements for each additional five contacts. VK and ZL: 20 contacts for the basic award; additional 10s for endorsement seals.

If interested: ZL YLs may be found each month on International YL Day (the 6th of each month), on 14.288 either in QSO or calling CQ YL every hour on the hour. Propagation permitting, and with the recent slight improvement [written in February], signals should be able to be heard on occasion. The YLs also operate on 18 and 80 meters on these days.

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CAN YOU GET ON THE CLASSROOM NET? Come to 7.238 at 1200 UTC daily or 21.395 later in the day. If you can't work WB2JKJ and the Crew at Junior High School 22 on Manhattan's Lower East Side, you may be shut out of our QSL Of The Week Award contest. Send a card today via the *Callbook*. BNB570

PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40			20	15	15	15	15	
SOUTH AFRICA									15	15	15	
U. S. S. R.							20	20				
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20	20						15				
ARGENTINA										15	15	15
AUSTRALIA	15	20				40	20	20				15
CANAL ZONE	20	20	40	40	40	40			15	15	15	20
ENGLAND		40	40					20	20	20	20	
HAWAII	15	20	20	20	40	40	40					15
INDIA								20	20			
JAPAN								20	20			
MEXICO	20	20	40	40	40	40			15	15	15	20
PHILIPPINES								20	20			
PUERTO RICO	20	20	40	40	40	40			15	15	15	20
SOUTH AFRICA										15	15	20
U. S. S. R.								20	20			

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20	20	20		40	40	40	40				15
ARGENTINA	15	20		40	40	40					15	15
AUSTRALIA		15	20	20			40	40				
CANAL ZONE			20	20	20	20	20	20				15
ENGLAND									20	20		
HAWAII	15	20	20	40	40	40	40					15
INDIA		20	20									
JAPAN	20	20	20			40	40	40			20	20
MEXICO			20	20	20	20	20					15
PHILIPPINES	15						40		20			
PUERTO RICO			20	20	20	20	20	20				15
SOUTH AFRICA										15	15	
U. S. S. R.									20			
EAST COAST		80	80	40	40	40	40	20	20	20		

Between April 29th and May 3rd expect an unsettled to active geomagnetic field and poor ionospheric propagation. Be alert for extremes of weather and geologic upsets such as volcanic eruptions and earthquakes on May 1, 14, and 30. Please note that expected conditions may vary from predicted dates by as much as two days in either direction; most likely earlier rather than later.

MAY

SUN	MON	TUE	WED	THU	FRI	SAT
					1 P	2 P
3 P	4 P–F	5 F	6 F–G	7 F–G	8 G–F	9 F
10 F–P	11 P	12 P	13 P	14 P	15 P	16 P
17 P	18 P–F	19 F	20 F–G	21 G	22 G	23 G–F
24 F–P 31 P	25 P	26 F–P	27 F–P	28 P	29 P	30 P

JUNE 1987
Issue #321

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TM-3530A p. 18

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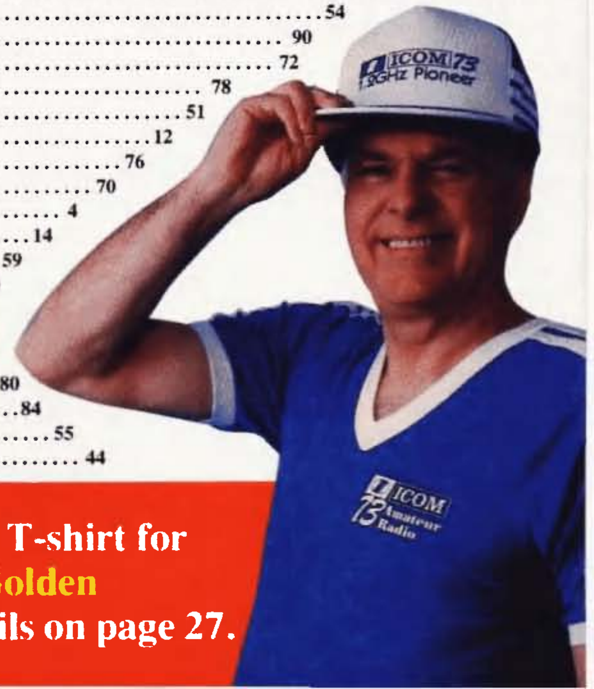

Receive a FREE hat and T-shirt for entering the 73/ICOM Golden Gigahertz Contest. Details on page 27.

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NEVER SAY DIE

ENGLISH—THE INTERNATIONAL LANGUAGE

Most ham contacts are in English, no matter where you are in the world. . .except perhaps in South or Central America, where Spanish is often the rule. Is this a good thing for the hobby?

There are two movements afoot in America today—one to make our country bilingual—the other to make English the national language by law. The enormous influx of Spanish-speaking people from Cuba, Mexico, and other Latin countries has created this problem. Spanish radio, television, newspapers, and magazines have made it unnecessary for these immigrants, legal or illegal, to bother to learn English.

In past immigrations, we often found the first generation resisting English, living in ghettos (barrios) to avoid having to learn the new language—which admittedly is difficult for adults. The children learned English in school and then spoke it at home when they were married, getting away from their parents' language. Often the grandchildren never bothered to learn the old language at all.

It's difficult enough to get along when everyone speaks one common language—which I think is one of the greatest strengths of America—but when people are unable to communicate, it almost always leads to suspicion and paranoia.

> ***"It doesn't take much of a command of a language to give a name, city, report, and request for QSL—which, sadly, is about all most of us demand of our ham contacts."***

I've heard English-speaking ham ops on 20m fire up on frequencies occupied by Spanish-speaking amateurs—just as if they weren't there. If you can't understand them, they don't exist. And I've heard Spanish-speaking amateurs do the same thing—as if the English-speaking contacts weren't real.

What can we do about this mess? Should we all learn enough Spanish to make contacts in that language? It doesn't take much of a command of a language to give a name, city, report, and request for QSL—which, sadly, is about all most of us demand of our ham contacts.

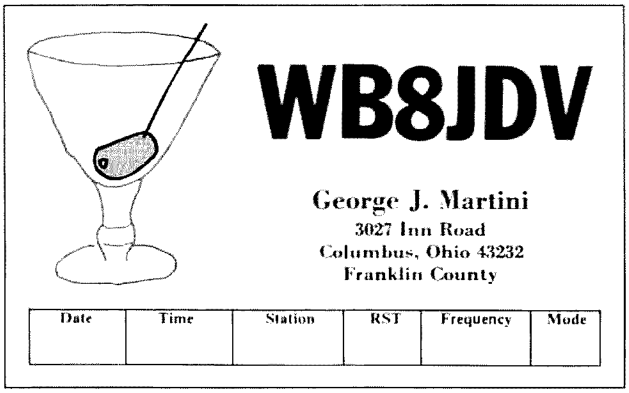
Perhaps, if we recognize and admit that English has become the world's foremost language, we can put this into perspective. Most countries of the world are teaching English as a second language. Thus one of the better uses of amateur radio might be as a way to help DX hams improve their English—a language they often need for business.

Look at the problems Canada has had as a result of bilingualism! It's been one of the most divisive forces they've had to deal with. It's made it possible for rabble-rousers to get serious consideration for dividing the country in two—English-speaking and French-speaking. Could America face a similar separatist problem some day?

There is a tendency to put down Americans because so few of us are able to speak more than one language—and that one not very well. I remember all too well the suffering I went through in high school trying to learn French. That was mind-numbingly awful.

There are some signs of a movement to get American edu-

Continued on page 10



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

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Rates: in the United States and Possessions: One Year (12 issues) $24.97; Two Years (24 issues) $45.47. Elsewhere: Canada and Mexico—$39.00/1 year only, US funds. Foreign surface mail—$45.00/1 year only, US funds drawn on US bank. Foreign air mail—please inquire. To subscribe, renew or change an address: Write to Subscription Department, PO Box 931, Farmingdale NY 11737. Return postage guaranteed. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients. For questions concerning your subscription, call toll free 1-800-227-5782. To place subscription orders, please call us toll free at 1-800-722-7790 between 9 am and 4:30 pm Eastern time or write to *73*, Subscription Department, PO Box 931, Farmingdale NY 11737. ***73 Amateur Radio*** (ISSN 0745-080X) is published monthly by WGE Publishing, WGE Center, Peterborough NH 03458-1194. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Canadian second class mail registration number 9566.

Microfilm Edition—University Microfilm, Ann Arbor MI 48106. **Postmaster:** Send address changes to *73 Amateur Radio*, Subscription Services, PO Box 931, Farmingdale NY 11737. Nationally distributed by International Circulation Distributors.

QRX . . .

Novice Numbers

NOVICE APPLICATIONS have quadrupled since Novice Enhancement went through. **Larry Weikert**, Chief of the General Radio Branch in Gettysburg, is quoted in the *W5YI Report* as saying, "We will probably process in excess of 6,000 Novice applications this month. . . as opposed to a normal of 1,500." It's obviously too early to make a judgement about any long-term effects of Novice Enhancement, but it's possible that the desirability of voice and digital privileges to prospective hams may be strong enough to offset the negative aspect of having to learn code. *73* has long maintained that the major breakthrough ham radio is searching for can *only* be found in a no-code license. We wouldn't mind being wrong on this one.

Ham/West R.I.P.

JOHN (W7IA) AND JAN (N7YL) WEAVER have decided to cancel plans for the 1987 Ham/West hamfest. In the two years that Ham/West existed, attendance never grew to a level that would support the show. Despite good reviews from both the industry and the public, in the end the only review that mattered came from the ticket sales.

10m Novice Nets

IT'S GREAT to see that Novices are being welcomed with open arms onto their new frequencies. KB1XD wrote to say that the **Ten Meter Rag Chew Net** has been formed with Novices/Technicians in mind. The TMRCN meets every Sunday night at 0000 UTC on 28.400 MHz USB. N0HBS wrote to tell us about the **Rochester (Minnesota) 601 Novice Net** that meets every Friday night at 0100 UTC on 28.306 MHz. The "601" in the name refers to the first meeting of the net, which was at 6:01 p.m. CST (0001 UTC) on March 21. Both nets encourage hams of all classes to check in.

New in L.A.

BILL SMITH N6MQS has decided to put his money where W2NSD's mouth is. Impressed by Wayne's renewed enthusiasm for the hobby, Bill has opened up a ham radio store called **A-TECH** in Burbank, California. Until now there had been only three ham stores in the greater Los Angeles area—which has one of the largest concentrations of hams in the country. If you're in the L.A. area, drop in to A-TECH at 1033 Hollywood Way in Burbank, and tell 'em Wayne sent you.

Summer is the season to hit the road with ham radio. This 15-Watt 80m mobile setup produced contacts of up to 600 km and illustrates the fact that a DXpedition need go no further than around the block. From left to right: Liisa OH2BYL/OH7LP, Anssi OH2QV, Aleksi, Katri, and Inkeri. (Photo by OH2BOX.)

Contest Update

WE'VE BEEN TRYING to get our contesting program up to date in recent months, and progress is being made. If you want to know where you stand in the **1987 World SSB Championships**, the top claimed scores for the January Classics are on page 42. *73* and ICOM have combined forces to sponsor a 1.2 GHz contest on July 13–14. This new **Golden Gigahertz Contest** awards a free hat and T-shirt to each entrant. Complete details and rules can be found on page 27. We've also got something big cooking for the beginning of September. **The National Championships** will occur on September 5 (CW) and 6 (SSB), and for the first time ever the little gun has a chance to become a champion. These events have been designed to single out the best contest operators, not the stations with the biggest hardware investment. The contests are open only to single-operator stations in the U.S. For starters, external amplifiers are prohibited, and a mandatory band-switching rule and antenna multiplier put a premium on the operator's skill. The complete rules will be published next month—if you can't wait, send an SASE to The National Championships, 2665 Busby Road, Oak Harbor WA 98277.

Lucky Number 6

DENNIS MARTIN N0GPD is throwing a party—and everyone's invited. Since Dennis was born on the sixth day of the sixth month, he's holding a six-meter birthday party for himself. He'll be on a hilltop in grid square EN20 on 50.150 MHz SSB from 2300 UTC June 5 through 2100 UTC June 7. No doubt he'll have a few six-packs up there with him. Work a rare grid square and wish Dennis a happy birthday. QSL via Dennis Martin N0GPD, 1211 N. 26th Street, Council Bluffs IA 51501.

New Digs

KENWOOD is consolidating its consumer electronics division (Kenwood Electronics) and its communications division (Trio-Kenwood Communications) in a single new building. The move was necessitated by Kenwood's growth in recent years. The new office is located at 2201 East Dominguez Street, Carson CA 90801.

Hey, Ralph

A DAY DOESN'T GO BY that someone doesn't call the *73* editorial offices looking for ***The New Weather Satellite Handbook*** by *73* columnist **Dr. Ralph Taggart WB8DQT**. For those of you still searching, it is available from the author at 602 S. Jefferson, Mason MI 48854 ($13.50 ppd.; $14.50 outside the U.S.).

Real No-Code

ON THE BACK OF PLACEMATS used by Pizza Hut is a section for kids on learning the Morse code in order to decipher a "hidden" message. Unfortunately, this must have been thought up by somebody else named Morse—many of the letters are wrong.

YHOTY Nominations

THE WESTLINK REPORT is soliciting nominations for the **1987 Young Ham of the Year Award**. Any licensed amateur 18 years old or younger is eligible for the award, which was created to honor the ham-related achievements of younger members of the fraternity. Letters of nomination should detail the reason why an individual should be considered for the

award, and letters written by minors must be countersigned by a parent or legal guardian. All letters must include verifiable background material to prove any claims made. Send nominations by September 10 to Westlink Young Ham of the Year, 28197 Robin Avenue, Saugus CA 91350. The award will be presented at the ARRL Southwest Division Convention in Scottsdale, Arizona, on October 10.

Dayton Winners

THE 1987 DAYTON AMATEUR RADIO ASSOCIATION (DARA) Ham of the Year is Carol Perry WB2MGP, a school teacher from Staten Island, New York. She created and documented unique ham radio teaching methods and has been active in attempting to get her teaching curriculum accepted as part of secondary school training. Perry chairs the Educational Task Force of the ARRL's Hudson Division, and nationally she participates with the League's Ad Hoc Committee for the Advancement of Amateur Radio. The Specific Achievement Award winner is Arthur M. Gentry W6MEP of Northridge, California. In the 1950s Gentry developed the technology and operating practices that evolved into the standard for amateur repeaters as we know them today. He and his wife Millie K6JJN have maintained their own open two-meter repeater for more than 30 years. An in-depth two-part interview with W6MEP was published in *73*'s April and May Looking West columns. The Technical Excellence Award winner is Henry Oredson WØRLI of Santa Cruz, California. He is being recognized for his work in packet software development. WØRLI software ties individual packet operators to bulletin board systems locally, and bulletin boards to each other in a regional and national network. He is considered to be the father of packet networking worldwide.

"News"

SCANNING the *Los Angeles Times* of April 2, 1987, W2NSD came across this tidbit about the code requirement: "It's like having to pass a horseback riding test to get a driver's license." For more horsesense on the subject, check the Letters column on page 12.

The End

THIS MONTH'S QRX has been compiled with the help of WB6TPG, KE7C, KB6HYK, KT2B, KB1XD, NØHBS, OH2QV, *The Westlink Report*, the *W5YI Report*, and The Great Volu. Send your news and photos to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: QRX.

NEVER SAY DIE

from page 4

cation away from the eighteenth century system of memorization and tests. The main problem with memorization as a learning technique is that unless what has been memorized is used, and used frequently, it's soon forgotten and all the work spent memorizing it is wasted.

If you're not sure I'm right about that, dig out one of your old college books and see how much you remember of the stuff you had to memorize a few years ago. I still remember the shock I got when I returned to college after spending almost four years in the Navy during World War II. I'd one remaining calculus course to go, but it required my remembering the previous two years of calculus. I found I had zero recollection of it, so I had to spend a whole summer memorizing the same stupid stuff all over again.

"The recent legislation making cellular phone calls illegal to listen in on has provided a bonanza for both organized and disorganized crime."

Ask anyone from a foreign country how long it takes to start forgetting his vocabulary, even when he was brought up from birth with it. You either use something or you lose it.

In most parts of America we have so little opportunity to use foreign languages that even if we go to the trouble to learn them in high school we lose them quickly. If we're going to be serious about foreign languages, then we've got to change our whole system. To make us multilingual, we'll have to teach languages before the kids are seven years old and then make sure they have plenty of opportunity to keep their languages well used.

The problem with this is that there are so few benefits—certainly not enough to make up for the amount of work involved. Sure, we could teach all our kids French, Spanish, and perhaps German, right from the start. And we could help them keep up by having plenty of TV programs in these languages. But what's the benefit?

For that matter, if we're going to start getting serious about foreign languages, perhaps we'd better give some deep thought to Japanese.

No, the present system is working pretty well. Instead of our having us learning dozens of languages, we're gradually getting the world to turn to English. Our ham bands are one place where we can be a big help to DX hams. For foreign businessmen, the better their command of English, the more opportunities they have—even in their own countries. The airline pilots of the world speak English so they can communicate over the radio no matter where they are.

My suggestion is this—let's encourage foreign amateurs to speak English—let's help them with it. In cases where some of us have taken the trouble to learn a foreign language, we can use amateur radio to help us keep up with and improve our use of that language, but let's encourage American amateurs of foreign extraction to use English, even when talking with their old homeland.

America is still the foremost land of opportunity in the world, but a key element in success here is the ability to speak English. And, as a general rule, the better you speak English, the better your chances of being successful. We don't give the same opportunities to people who speak poorly—Spanish and Black dialects are particularly a barrier to sales, marketing, and executive jobs. Indeed, one of the best keys to joining the middle class lies in one's use of English.

I suggest we be polite about this, but keep in mind that amateur radio is an English-speaking hobby. It isn't something we're going to accomplish in a year, but if we keep our goal in mind, we'll get there.

I have no doubt I'll get a bunch of hate mail over this. It goes with the territory. But if someone has any unemotional data to offer, pro or con, my mailbox is open. S. I. Hayakawa, the former senator from California, is pushing for a constitutional amendment making English our national language. His reasoning makes good reading, the next time you see an article or book on the subject.

CONGRESS GOOFS

The recent legislation making cellular phone calls illegal to listen in on has provided a bonanza for both organized and disorganized crime. It's difficult not to laugh over the situation the cellular industry has gotten itself into in its blind pursuit of the fast buck.

What's happened is a mass move into cellular by criminals. They buy a cellular system, have an unscrupulous dealer alter the electronic serial number (ESN) on the built-in programmable IC, which makes calls both untraceable and free—a great combo. They tool around town, making calls to Pakistan, Colombia, and their Caribbean drug warehouses at will.

Cellular has turned out to be great for coordinating every kind of criminal activity. It's just what the criminals have been needing for years—a dependable, free, untraceable, and safe communications system. With a combination of pagers and cellular phones, crooks are making a shambles of the cellular system—all protected by Congress.

If you wanted to deal in drugs, how better to get orders from your customers than by giving them your cellular phone number? There's no way to tap a telephone that can be anywhere in a big city, operating through different cells as it moves around. And with an altered ESN it's all free!

If it weren't against the law to listen to cellular channels, I'd suggest we hams help the law by listening for suspicious cellular calls and recording them. Say, how'd you like to get the goods on some serious crooks and find (a) the evidence is inadmissible because it was illegally attained and (b) yourself on trial for making the recordings. So join me in a big laugh, okay?■

LETTERS

OL' CLEM

We have a neighbor, Clem, who is a senior citizen. Everyone loves Ol' Clem and we all try to look out for him and take care of him, but he is a rather independent old codger. Among other things, he insists on saddling up his old mule to ride the 13 miles to the post office each day to pick up his mail (we live in a very rural area of the southwest). He says it is nostalgic and he enjoys it.

We usually stop by and offer him a ride in our pickup, but he says he would rather ride the old mule. It takes him a lot longer to make the trip and it is somewhat uncomfortable, but he seems to enjoy it. Also, he says his mule takes up less space on the road than our truck. Of course, he occupies his portion of the road a lot longer to make the same trip, but that doesn't seem to matter to Ol' Clem.

He also says that at times when the weather is really bad, he can make the trip on the old mule when we can't get through in our pickup—but I don't remember many such times.

The only thing about Ol' Clem that really bothers us is that he is one of those who insist on keeping a rather archaic provision in our local driver's license exam requiring that all prospective motor vehicle drivers must demonstrate a clear capability to catch and saddle a mule and ride it for 13 miles without falling off.

My 15-year-old son just doesn't understand what that has to do with his ability to drive our 1987 model pickup truck. I truly love Ol' Clem and admire his ability and patience with that old mule of his, but I do agree with my son that mule technology doesn't relate well as the measure of one's ability to handle a modern pickup at 55 mph on the interstate.

The result is that a lot of our young folks are moving to other parts of the country because while they all want to drive cars and pickup trucks; they think it is pretty stupid for them to have to learn how to handle that old mule—to have to put up with its slow plodding pace and to take forever to ride those 13 miles to the post office.

I hate to see our young ones move off to other areas, but I really don't blame them under the circumstances. I'm starting today to get enough people together to out-vote Ol' Clem at the next election.

R. C. "Dick" Chabot N5JHW
Organ NM

TOWER TROUBLE

The article "Glen Martin M185A Tower" by N1EJF (*73 Amateur Radio*, April, 1987) reads like an episode from Laurel and Hardy Theater. No qualified engineer would ever permit a tower foundation to be installed as described in this article!

Where are the moment and uplift calculations? Apparently EJF used the mass theory (make it massive and it won't blow over). Where is the reinforcing steel? Concrete has little or no strength. How does EJF expect the foundation to hold together?

Probably the most unforgivable sin is the wood form. Leave the wood in the ground and backfill? Certainly not! What do you suppose will happen to the foundation when the wood rots? If the block of concrete doesn't crack first, it is going to wobble in its own space, that's what. Where is the compacted backfill? Does EJF think that by pushing loose dirt back into the hole it will reach its original compressive strength? Maybe in about 40 years.

The ground rod in the bottom of the hole is absolutely the wrong approach. The ground rod is going to corrode. This will leave a void in the concrete, and the void will collect moisture, which will eventually reach the tower base, which will also begin to corrode. The slug of moisture will freeze and the concrete will crack. No maybe about it. If EJF were concerned about grounding the tower, he would have used the foundation as a UFER ground or installed a counterpoise.

Fellow hams, DO NOT, I repeat, DO NOT use this article as an example of how to install a tower foundation. If the tower manufacturer condoned the method used to design and install the foundation, one may well question the integrity of the tower and Hazer unit. As for me, I will continue to consult a qualified engineer before I install a tower foundation. I suggest you readers do the same.

By the way, I hope N1EJF has a good home owner's insurance policy and an understanding insurance adjuster. I'm afraid he is going to need both.

Jim Sanford N0AIH
Omaha NE

Foundation dimensions were supplied by Glen Martin Engineering. One must make the presumption that they have the necessary data regarding moment and uplift to support their recommendations.

The compression strength of the concrete used is 3,000 pounds. This strength concrete is consistent with that used for building foundations in this area. An important consideration with any foundation of this type is that it sit on undisturbed earth BELOW the frost line. The steel base structure provides adequate reinforcement for the foundation; if desired, additional steel could be added, but this is considered unnecessary.

While there is certainly no requirement to leave any part of the form on the foundation, the untreated wood will rot quickly and not present the foundation any opportunity to move. The base is on undisturbed earth, and the lateral space will be compensated by surrounding fill. In any event, the lateral space (if any) will be microscopic in size when compared to the surface of the foundation. The foundation has gone through one complete season so far and no settling of the backfill has been noted. Mr. Sanford is correct when he states that fill should be compressed, and it was in this installation.

Grounding the tower in the manner that I described is not *intended to provide lightning protection, but to satisfy the National Electrical Code article 810. Per that code, the grounding material is noncorrosive and is run in a straight line to the point of nearest attachment on the tower. Even if the grounding material went away, any water that collected would not freeze as this area is located below the frost line.—N1EJF*

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Wayne Green Enterprises is a division of International Data Group.

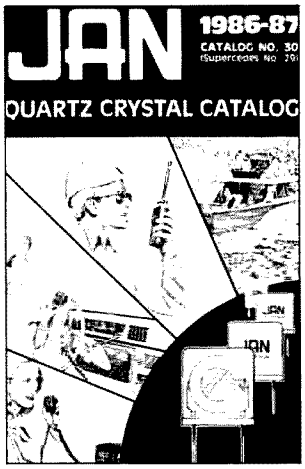
73 Amateur Radio (ISSN 0745-080X) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

NEW PRODUCTS

JAN CRYSTALS BOOKLET

A free booklet with general information on frequency control quartz crystals and listings of various kinds is now available from Jan Crystals. Among its topics, the booklet contains crystal data and current prices for the Novice through General bands, as well as for scanners, CBs, and business radios.

For your free copy, circle number 202 on your Reader Service card.



Free quartz crystal catalog from Jan Crystals.

ICOM TRANSCEIVERS

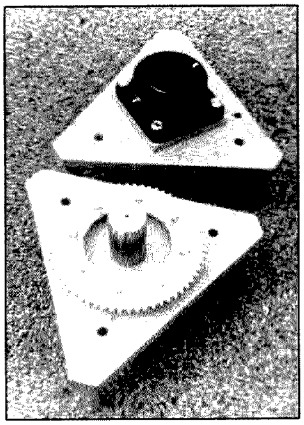
ICOM America, Inc., has introduced three new transceivers: the IC-761, the IC-375A, and the IC-1200.

IC-761

The IC-761 is an HF base-station transceiver rated at 100 Watts output on CW, SSB, FSK, and SSTV. It covers all bands from 160 through 10 meters, plus MARS and CAP operation. The IC-761 also features passband tuning, i-f shift, i-f notch, a dual-width adjustable level noise blanker, 32 memory channels, semi-duplex or split-band vfo operation, a built-in CW keyer, and a steep-skirted narrow CW filter. The 761 has a 28-volt power amplifier, an internal cooling fan, a large heat sink, a built-in switching-type ac power supply, and a built-in automatic antenna tuner.

IC-375A

The IC-375A is a 25-Watt 220-MHz base-station transceiver that covers 216–230 MHz. The 375A has 99 tunable full-function memories, passband tuning, a notch filter, a noise blanker, a built-in swr bridge, semi or full CW break-in, and a multi-function meter. Four scanning systems are available: band, programmable, mode, and memory scan with selectable lockout. All subaudible tones and standard repeater splits are built-in; odd splits are programmable.

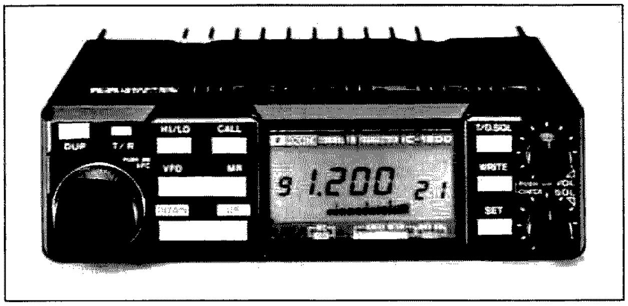


Rotating Tower Systems drive mechanism for rotating Rohn 45 and 55 towers.

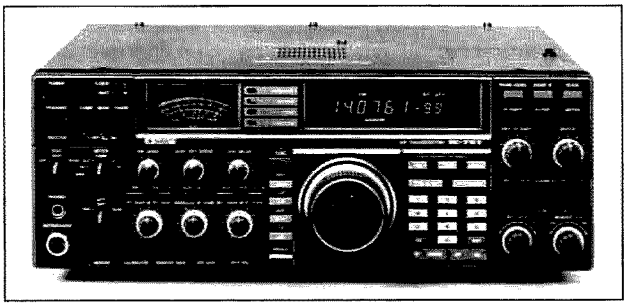
IC-1200

The IC-1200 is a compact 1.2-GHz transceiver for mobile or base operation. It covers 1240–1300 MHz. The 1200 has a large LCD readout, 21 memory channels, 10 Watts of output power, built-in subaudible tones, frequency scan, and memory scan. Its frequency control function automatically adjusts the receive frequency to that of the transmitting station. Two new options are the UT-28 digital code squelch unit (for digital coding and decoding) and the UT-29 tone squelch unit (to encode/decode subaudible tones).

Prices for all three transceivers are to be announced. For more information, contact your local ICOM dealer.



The IC-1200 1.2-GHz FM mobile/portable transceiver.



ICOM's new Big Gun HF transceiver, the IC-761.

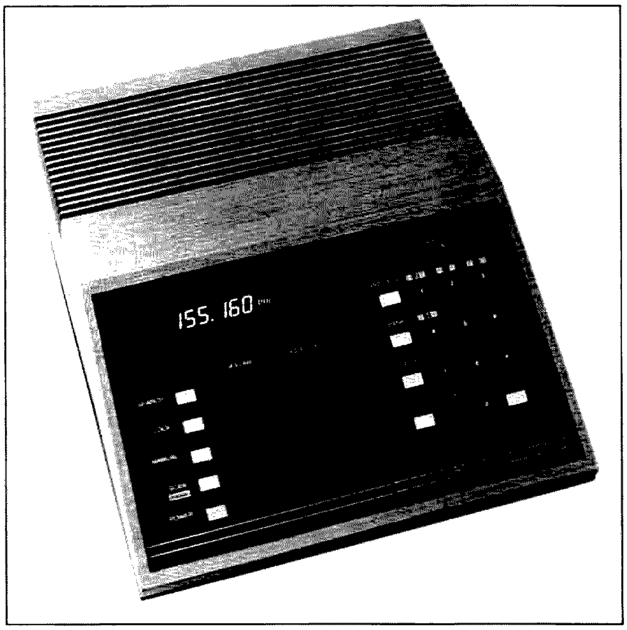
ROTATING TOWER HARDWARE

Rotating Tower Systems, Inc., now offers complete hardware systems to rotate Rohn 45 or 55 towers. Each system is tailored for separate mechanical and strength requirements of the selected tower. The hardware is easily assembled, all bearings and drive components are easily replaced without tower disassembly, and the rotating base can be mounted at any tower height. The hardware uses 2:1 chain drive with an HDR 300 rotor for increased turning torque and decreased rotational kinetic energy.

To receive further information on this hardware, circle number 205 on your Reader Service card.

REGENCY R-1090 SCANNER

The latest offering from Regency Electronics, Inc., is the R-1090, a 45-channel scanner. Its features include bank scanning, weather scan, and a priority control. The scanner covers more than 15,000 UHF/VHF frequencies on 30–50, 144–174, and 440–512 MHz. Forty-five preprogrammed frequencies enable the unit to be op-



The Regency R-1090 scanner.

erated right out of the box. Frequencies can be grouped into any of four channel banks for bank scanning, which can be scanned individually or all at once. It also includes channel lockout, fast and slow scan speeds, and a memory backup system.

The Regency R-1090 sells for $239.95

For more details about Regency scanners, circle number 206 on your Reader Service card.

KANTRONICS PERSONAL PACKET MAILBOX

The Personal Packet Mailbox from Kantronics, Inc., is a replacement plug-in 256K EPROM that lets you and others leave and collect messages in your Kantronics Packet Communicator, without disrupting the other functions of your packet unit. The mailbox is operated from your keyboard. The Personal Packet Mailbox option is currently available for the KAM, KPC-1, KPC-2, and KPC-2400. The unit retails for $39.95 plus $2.50 shipping; it includes a replacement plug-in EPROM and an installation/operations manual.

For more information, circle number 207 on your Reader Service card.

E.L. JONES QUICK SILVER

Quick Silver from E.L. Jones Co. is a silver-bearing bonding paste that flows at 430° F using a match, butane lighter, or soldering gun. It has a tensile strength of 18,000 to 22,000 psi.

Quick Silver bonding paste.

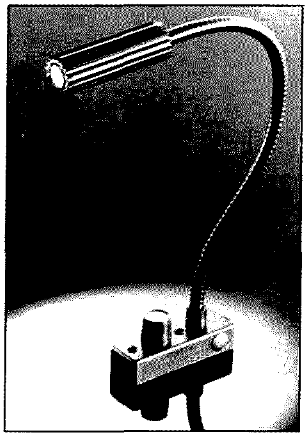
It comes in a syringe-type applicator that lets you apply the paste and then apply the heat. Quick Silver is available for $9.95, plus $2 p/h.

For more information about Quick Silver, circle number 209 on your Reader Service card.

SCOOTER STANDBY POWER SUPPLY/ VOLTAGE REGULATOR

Ohm Electronics, Inc., has released the Scooter® model SPS450VR standby power supply/voltage regulator, which is rated at 450 Watts continuous duty.

When primary power fails or drops below 15% of nominal, inverter power is automatically provided at a regulated 120 V ±5%. When primary power returns to within 7% of nominal, the system automatically switches back to normal line operation and begins to recharge the battery to full charge.



The Littlite from CAE.

The circuitry monitors the line voltage for electrical spikes and surges, providing complete protection. Other features include an internal audible alarm system (primary power loss and low battery), regulated automatic recharging, automatic shutdown to protect battery after discharge, alarm silencing button, status indicator LEDs, and master on/off switch.

The SPS450VR retails for $895.

For more information, circle number 210 on your Reader Service card.

NEVADA COIL

The Nevada RC 26 "Roller Coaster" coil, designed and manufactured by G4JEV, is being distributed by Telecomms of Portsmouth, England. It is intended for use in high-power ATUs and transmitter output stages. The unit has a unique roller suspension system, which both minimizes "contact bounce" and ensures the best possible contact between roller and coil during adjustment. The Nevada Roller Coaster has a power-handling capability of up to 1 kW and an inductance of 30 uH maximum. The unit sells for around $33.

For further details, circle number 211 on your Reader Service card.

CAE LITTLITE

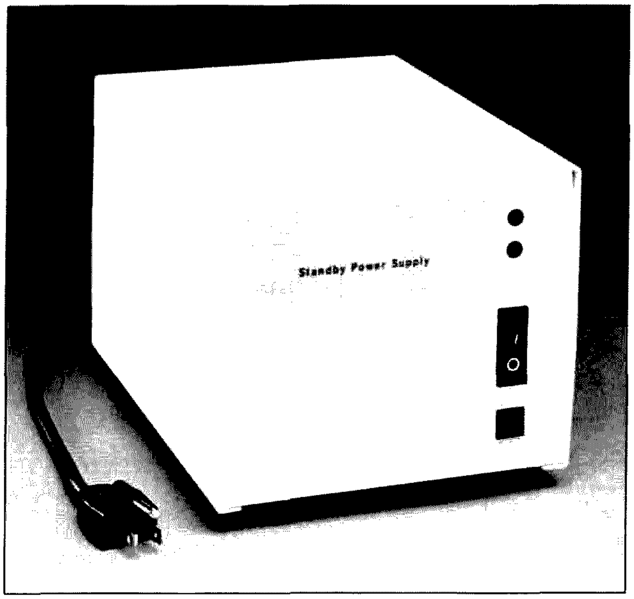
The Littlite from CAE, Inc., is an excellent way to illuminate your radio bench. A *73* staff member used the Littlite during a recent contest and found that it made operating at night much more comfortable. Its intensity can be varied from dim to bright white, and the area of illumination can be confined to the front of the radio and log book.

For more information on the Littlite, circle number 212 on your Reader Service card.

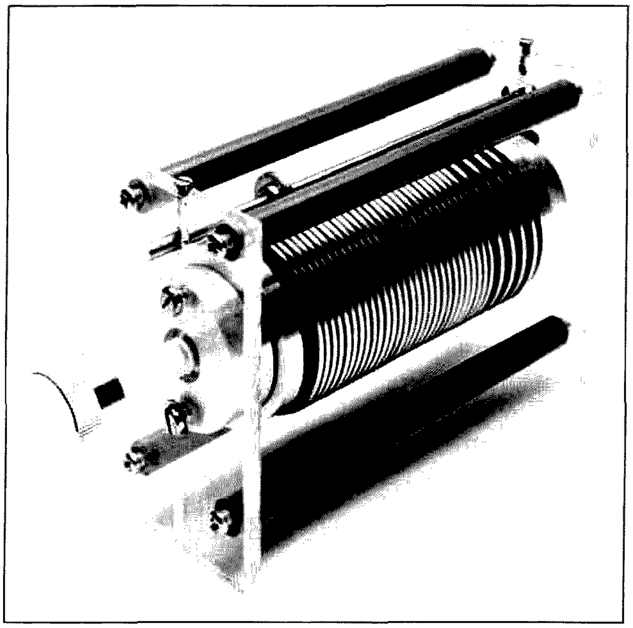
UNIVERSAL ELECTRONICS PUBLICATIONS

The latest catalog of electronics books and publications by Universal Electronics, Inc., has been released. Topics include RTTY, shortwave, facsimile, weather, radioteletype, and satellite TV.

For a complete list of publications from Universal Electronics, circle number 201 on your Reader Service card.



The Scooter SPS450VR standby power supply/voltage regulator.



The Nevada RC 26 Roller Coaster variable inductor.

73 Review

ICOM IC-38A and Kenwood TM-3530A 220-MHz Transceivers

ICOM America, Inc.
2380-116th Avenue NE
Bellevue WA 98004
Price class: $400

by Peter H. Putman KT2B

Trio-Kenwood Communications
1111 West Walnut Street
Compton CA 90220
Price class: $450

The IC-38A and TM-3530A are part of the first wave of what can only be a flood of 220-MHz mobile equipment, now that Novices have gained access to the band. Both radios offer full coverage of the present 220-MHz segment (220–225 MHz), 20–25 Watts output, and selectable subaudible tone programming. Both radios can be used in base-station operation as well, and both have easy-to-read green LCD displays.

These radios represent two very different approaches in "top-of-the-line" 220 FM transceivers, however! There are more differences between the two units than just the $50 in list price. Table 1 summarizes the basic features of both radios. Which is the right one for you?

Features

Let's start with the Kenwood TM-3530A, which sizes up at 2-1/2" high, 7" wide, and 7-1/2" deep and weighs four pounds. Finished in black, it makes for a slick-looking transceiver, both on the operating bench and under the dashboard. The front panel is dominated by the large (2" x 1") green LCD display, which shows received signal strength/power output, offsets, scan modes, frequency, memory channel, center tuning, priority channel, tone function, and repeater reverse. The signal strength/power output display is sort of a three-colored curved display, with marks at the 1-, 3-, 5-, 7-, 9-, and +20-dB points. Other selected functions appear over different colored bands when enabled, which is very handy when you're operating in the car and taking quick glances at the radio.

You'll notice right away the absence of a tuning knob! All frequency selection is performed by punching in the last four digits of the desired frequency (i.e., "4060" for 224.060 MHz) on the front-panel keypad, or by using the UP/DOWN scanning control on the supplied microphone. The large knob on the front panel selects any of the 23 memory channels or the standard CTCSS tone frequencies. Two of the memory channels can be paired up for oddball offsets if need be. Other controls below the keypad are for volume, squelch, and power on. Above the memory tuning knob are switches to lock the displayed frequency and enable the memory channel pairings for offsets.

> ***"Both the TM-3530A and IC-38A represent good values in 220-MHz FM equipment."***

To the left of the display are controls for priority channel, repeater reverse, lamp control, low power, scanning, and alert (checks the priority channel every six seconds). Below the display, Kenwood's DCS (digital coded squelch) system can be enabled and programmed. On the far right, buttons are provided for an optional voice synthesizer VS-1, tone activation, and the built-in telephone autodialer, which holds up to 15 numbers. This latter function is very useful if you make a fair amount of autopatch calls. It could also be used for DTMF control of a repeater or link. The keypad rounds out the list with frequency selection, offsets, memories, and scanning modes.

The rear panel couldn't be simpler: antenna connector, dc power, and external speaker jack. The supplied speaker is mounted on top of the chassis, a Kenwood tradition that started with the TR-7400A and has continued intermittently since. This would make certain mobile installations a bit difficult unless you employ an external speaker. The supplied scanning microphone is of the dynamic type with up/down controls and no DTMF pad—obviously one is not needed!

On to the ICOM IC-38A. It is considerably smaller, sizing up at 1-7/8" high by 5-1/2" wide by 6" deep and tipping the scales at three pounds. The finish is black with a bold white logo on the top case. The 3/4" x 1-7/8" green LCD display also dominates the front panel, showing frequency selected, duplex mode, tone, power output, received signal strength, memory functions/memory channel, and offset write function.

All frequency selection is performed via the front tuning knob or the supplied up/down microphone. ICOM has chosen to make the tuning rate selectable via the SET control, offering 5-, 10-, 15-, 20-, or 25-kHz steps per dial click. This is handy if you want to scoot around the band in a hurry! The tuning knob also selects memory channels, and there are 21 of those to choose from. Below the LCD display are the power on, volume, and squelch controls, as well as the HI/LO power switch.

The rest of the controls are: to the left of the

display, a duplex/simplex switch, transmit/receive indicator (green LED), tone activation for CTCSS, memory write button, vfo/memory select, and frequency stepping in 1-MHz steps up or down. On the right of the display, you'll find two switches, one of which is the previously mentioned SET (selects offsets, tone frequencies, and tuning steps) and T/D SQL, which enables either the UT-28 digital code squelch option or UT-29 tone squelch option.

The rear panel consists of a large heat sink (proportional area equivalent to the TM-3530A) with connections for dc power, antenna, and external speaker. The antenna connector is on a cable extension, following the design of the IC-27A/37A/47A series radios. This saves much knuckle-busting as you try to fit a PL-259 into a tight compartment around a heat sink! Unfortunately, the external speaker jack is very hard to access. The built-in speaker is mounted on the bottom of the chassis, making for a simple mobile installation but posing a bit of a problem in the base station unless an external speaker is used.

Observations

Now for the fun part. Both radios are enjoyable to use in mobile and base applications. My acid test for any radio is to open the box and see how many functions I can figure out before opening the manual, and in this case the ICOM won hands down—but the reason for this is that the 38A has far fewer controls and options to deal with.

The Kenwood system of direct frequency selection from the keypad (as opposed to a tuning dial) took some getting used to, and I personally prefer the more conventional approach. I also liked the rapid frequency stepping available with the 1-MHz and STEP switches on the IC-38A.

Both radios have more than enough output to operate in the noisiest of environments, with the ICOM a bit higher at 2.4 Watts and the Kenwood at 1.5 Watts. The supplied speakers work very well, although the TM-3530A sounded a bit tinny. Received audio reports were about equal as well, both in repeater and simplex use.

As far as the control layout goes, the LCD display on the IC-38A is considerably brighter than that of the TM-3530A. I'd rate character readability about equal on both. The IC-38A is by far the easier of the two to set up and operate while you're mobile, due to its simple design, but then I've always preferred simple transceivers for the car.

One nice feature on the TM-3530A is the automatic offset selection when a frequency is punched in. This applies only above 223.940 MHz, as all frequencies selected below here come up with a simplex display, and you have to select the correct offset. Of course, this is easily solved by putting those frequencies and offsets in memory.

Another nice touch is the built-in DTMF encoder, so you are touchtone™ ready—right from the box! Contrast this with the IC-38A, which will not allow touchtone operation unless the optional IC-HM14 DTMF microphone is purchased as well.

The TM-3530A's telephone autodialer is slick. You can store up to 15 seven-digit telephone numbers for recall in any order, making dialing while you're driving much safer. It would be nice to have a larger storage capacity per channel, say on the order of 10 or even 15 digits per channel to combine access codes and telephone numbers with the appropriate pauses built in. The autodialer has a side benefit: Simplex 220-MHz linking and remote control functions can easily be supervised from the TM-3530A autodialer.

The ALERT and PRIORITY channel functions on the TM-3530A received no usage here, but you may find them useful for local monitoring of repeaters or simplex net frequencies. The IC-38A makes no provision for these functions.

As far as the scanning functions go, the IC-38A provides one scan mode for the vfo frequency range and one for the memories. If

Feature	Kenwood TM-3530A	ICOM IC-38A
Coverage	220–225-MHz T/R	220–225-MHz T 215–230-MHz R
Display	Green LCD, Multifunction	Green LCD, Multifunction
Memory Channels	23	21
Offsets	+1.6 MHz, −1.6 MHz Programmable	+1.6 MHz, −1.6 MHz Programmable
Power Output (claimed)	25 Watts HI, 5 LO	25 Watts HI, 5 LO
DTMF Ready?	Yes	No
Autodialer	Yes	No
CTCSS Tone Equipped?	Yes	Yes
Selectable Frequency Steps?	No	Yes
Digital Squelch Option?	Yes	Yes
Priority/Alert Channels?	Yes	No

Table 1. Basic features of the TM-3530A and the IC-38A.

Specification	IC-38A Measured	Claimed
Power Output		
HI	22 Watts	25 Watts
LO	4 Watts	5 Watts
Current Drain		
HI	5 A	6.5 A max.
LO	2.4 A	3.0 A approx.
With receiver squelched	300 mA	450 mA
Receiver Sensitivity	.2 uV for 10-dB S/N	.18 uV for 12-dB Sinad
	.6 uV for 20-dB S/N	N/A
	2 uV for S9	N/A
Selectivity	−6 dB ± 10 kHz	−6 dB > 12.5 kHz
	−30 dB ± 15 kHz	N/A
	−50 dB ± 20 kHz	−60 dB 25.0 kHz
Squelch Law	.15 uV	N/A

Table 2. Performance data—ICOM IC-38A.

Specification	TM-3530A Measured	Claimed
Power Output		
HI	25 Watts	25 Watts
LO	5 Watts	5 Watts
Current Drain		
HI	4.5 A	6.5 A approx.
LO	2.1 A	2.5 A approx.
With receiver squelched	310 mA	600 mA
Receiver Sensitivity	.25 uV for 10-dB S/N	.25 uV for 12-dB Sinad
	.6 uV for 20-dB S/N	N/A
	2.5 uV for S9	N/A
Selectivity	−6 dB ± 10 kHz	−6 dB > 12 kHz
	−20 dB ± 15 kHz	N/A
	−40 dB ± 20 kHz	−60 dB 24 kHz
Squelch Law	.16 uV	.125 uV

Table 3. Performance data—Kenwood TM-3530A.

you're into scanning, the 38A's vfo scanning mode will drive you crazy. Why? Because (for some strange reason) the IC-38A receive coverage is from 215–230 MHz. This really makes no sense! I can't imagine any current operations on those channels I'd care to listen to at all, and it just makes the scan rate longer when you have to cover an extra 10 MHz out of the band.

The TM-3530A also provides two basic-scanning modes: keyboard programmable scan and memory scan. The latter is obvious, and the former involves setting the upper and lower limits of the band in which you wish to scan. Those band limits are 220–225 MHz, unlike the IC-38A. You can also skip certain memory channels with the Skip Scan function—also available on the IC-38A.

I should also briefly mention a problem I had with the TM-3530A out of the box: No matter how fast I keyed the PTT switch on the microphone, the transmitter stayed on for a minimum of one second. A call to Kenwood revealed this to be a microprocessor problem, and I was instructed to perform the reset function outlined in the owner's manual, which cured the problem nicely.

I should add that both transceivers appear to have adequate transmit/receive switchover time to function in packet radio operations, which is perhaps the fastest-growing mode on 220 MHz today.

Now for some test data (see Tables 2 and 3). The equipment consisted of a Hewlett Packard signal generator, Bird 43 wattmeter with 5C and 50C slugs, a 25-Watt coaxial resistor, and Astron RS 7 power supply. All measurements were made at 13.8 volts dc.

Conclusions

There were only a few drawbacks on each radio. On the IC-38A, inserting and/or removing an external speaker plug takes smaller fingers than I or anyone I know posesses! Also, not having DTMF functions included on the microphone is kind of silly for the price of the radio. Finally, the receiver coverage (and scan coverage) is too wide.

On the TM-3530A, I miss the conventional tuning dial knob. The audio sounded tinnier than it should have, given the speaker size, and I found the front-panel control layout unnecessarily busy for mobile operation.

From my observation of the two radios, the Kenwood makes the better base-station radio, what with the built-in feet, overall control layout, and top-mounted speaker. And indeed, it would appear that in this area many operators are using it for that purpose. The ICOM is better suited to mobile performance. The display is easy to read, the controls easy to grasp, and the size just right for today's compact cars.

Want everything in a 220 rig? The TM-3530A has everything but the kitchen sink installed, which should keep you happy for a while! Want to set it and forget it? The IC-38A offers simple, no-frills communications. Both the TM-3530A and IC-38A represent good values in 220-MHz FM equipment, and each is versatile enough to be used in a variety of applications.■

Com-Rad Hi-Rizer

by Marc Stern N1BLH

Com-Rad Industries
PO Box 554
Grand Island NY 14072
Price class: $117, plus $5 s&h

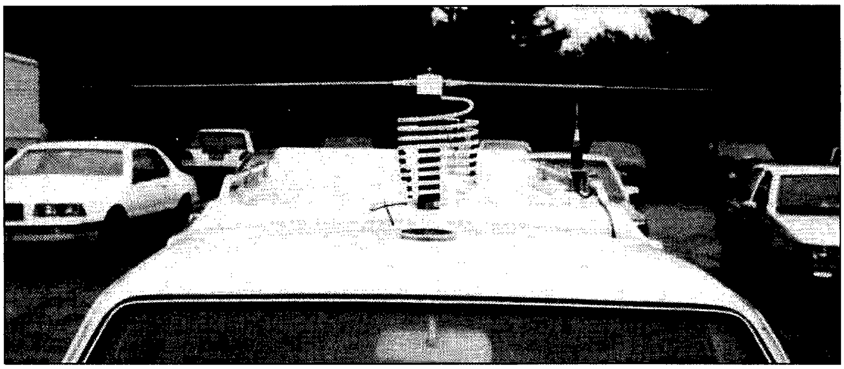


Photo A. The Hi-Rizer configured for mobile operation.

Although it looks a little like R2D2 and sometimes a piece of wire will hear better, there's no denying that the Hi-Rizer by Com-Rad Industries works. In fact, it's surprising just how well it does work. Just ask the ZL who was contacted on the low end of 20 one morning . . . or the UA. Each gave a 599 report rather recently.

And this is quite surprising for an antenna that is a compromise and that looks like an inductor gone wild or a strange-looking car radio antenna. It's also surprising to find such good performance from an antenna that's about 18 inches high and that sports a humongous, nine-turn aluminum tubing inductor. Essentially what Com-Rad has presented the world is a short, tuned inductor that gives you, in turn, a short, inductively loaded antenna.

Looking at the antenna, you'll see it's little more than a balun with its inductor and radiators attached. There's a shorting clip at the top and an SO-239 at the base. That's all there is to it. The radiators seem to be standard auto radio antenna replacements. They are placed on studs at the top and tightened with set screws.

"The Hi-Rizer is made for operators who have antenna space restrictions, such as those in apartments or condos."

As you can see, it's not a very complicated antenna. It's made for operators who have antenna space restrictions, such as those in apartments or condos. To facilitate this use, Com-Rad provides about 30 feet of RG-58 coax and a quarter-inch mesh screen that serves as an indoor ground plane. The coax, evidently, is supposed to serve as the counterpoise. Com-Rad delivers the antenna cable unterminated, so you'll have to spend some time with a hot soldering iron before you can use the cable.

Interestingly, I tried several lengths of coax and found the antenna loaded up fairly well without regard to length. There is a special knack to using the coax, though. Com-Rad goes to great lengths to explain that the antenna cable can't be run in parallel—it must be laid out in a pattern that avoids paralleling. In fact, the instructions provide several diagrams detailing suggested cable routings. In this way, you prevent cable coupling into the antenna, and the cabling can also serve its purpose as part of the ground plane.

Overall, the antenna is quite straightforward to set up and use. All you do is unpack it and attach it to the particular mount you are planning on using, fixed or magnetic. For example, Com-Rad delivered the evaluation unit with a five-inch diameter mag mount on the base. It used the standard 3/8-by-24 connector base. There was another 3/8-by-24 base on the grounding mesh that was secured with four healthy bolts. To use the mesh, simply unscrew the mag mount base and insert the Hi-Rizer into the ground mesh.

As you can see, getting to this point is a piece of cake, and that ease of use continues into tuneup and use of the Hi-Rizer.

Tuning the Antenna

To tune the Hi-Rizer, you simply set the radiating elements to roughly 25 inches and leave them there. Then refer to a chart supplied by Com-Rad which shows you the number of turns to tap according to the band you are using. For example, 40 meters requires that you simply insert the shorting clip without attaching it to the coil. Apparently it acts ca-

pacitively at that frequency. However, when you move up to 20 meters, you short out about a turn and a half. It's just that easy to use. There's a short instruction sheet with the antenna—really more of an ad than anything else—which indicates how many turns of the coil to tap.

Interestingly, Com-Rad urges you to load the antenna up through a tuner, which I did. In this way, it's easy to get a flat match, and, as a benefit, you also attenuate some harmonic radiation which keeps TVI out of the picture. You would also normally think the tuner is needed because of the way the antenna is being used—no real ground and, possibly, several stories above earth ground, which almost guarantees poor matching characteristics. But, much to my surprise, I found that straight through the tuner, the Hi-Rizer matched at about 1.5:1, which isn't bad when you consider the nature of the antenna. (A brief testimonial letter indicates this wasn't a fluke with me. Other operators report the same things.)

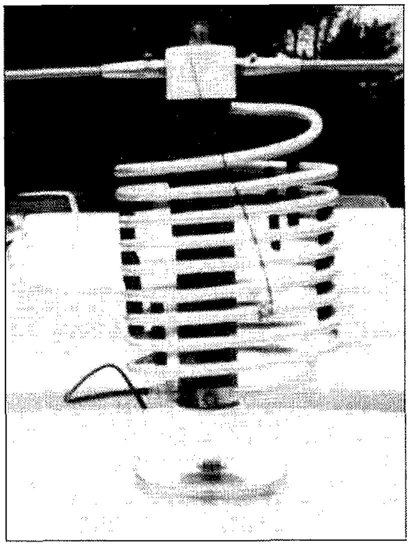


Photo B. Close-up of the Hi-Rizer coil.

Using the Antenna

After you've tuned the Hi-Rizer, the next step is to use it and that's the simple part. If you've done everything correctly, you simply have to tune up your rig (if yours isn't solid-state) and you're off to the races.

Realize, though, that this antenna isn't a beam and there's no way you can compete with the Big Guns. If you're using the Com-Rad, you'll have to sharpen your DX techniques to work any rare one.

Com-Rad says that you can place the Hi-Rizer just about anywhere and, in truth, you can. However, I would advise placing it in an area where people aren't likely to go. The reason is that if you're on the air and someone brushes by the antenna, not only will he upset the pattern, but he also runs the risk of getting rf burns. An unused room or deck is a good bet.

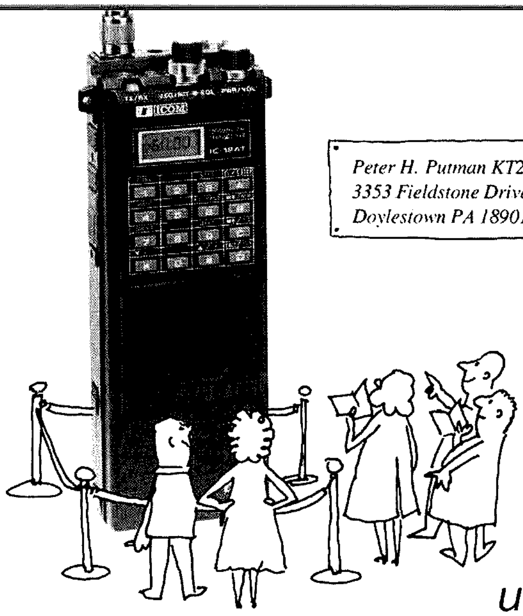
I would also suggest you pay close attention to the ground mesh. Com-Rad terminates it with a couple of pieces of plastic to keep hot rf away from roving youngsters. Still, if they put their fingers into the mesh grid while you're on the air, they're likely to get rf burns. Again, the unused room makes a great deal of sense.

Finally, Com-Rad suggests you can use this mobile, and with a five-inch magnetic mount, I certainly agree. But, remember that you have about 50 inches of radiator extending across the roof of the rear deck of your car, so keep passersby clear and keep the vehicle clear of obstructions. Also, with the size of the coil, I suggest that you keep your speed down.

Conclusions

Overall, the Com-Rad Hi-Rizer is a decent, small antenna for operators with antenna restrictions or problems. If you think about it, you must seriously realize from the start that it is a compromise antenna, which isn't a beam. Further, if you're operating from inside a building, you must also expect the performance, in some cases, to be marginal, even compared to a short length of wire out a window. In this case, the wire will probably hear better.

However, if you're willing to accept these facts, then you'll find the Hi-Rizer is a fun antenna to use. Ultimately, though, what counts is that you stay on the air. That's the point of an antenna like this, isn't it?■



Peter H. Putman KT2B
3353 Fieldstone Drive
Doylestown PA 18901

A Guided Tour of 1.2 GHz

KT2B covers the basics of operation on Novice Enhancement's least-understood allocation, the 23-cm band.

With the adoption and implementation this year of the FCC Novice Enhancement Docket (PR Docket 86-161), Novices have substantially increased their privileges on three bands encompassing vastly different parts of the amateur spectrum—10 meters, 1.25 meters, and 23 centimeters. Ten-meter activity around my area has surely multiplied in the past few months and 220 seems to be coming along nicely, but I have a feeling that 1270-1295 MHz remains a puzzle to much of the Novice population despite an adequate supply of equipment for the band. Well, you can stop scratching your head! I'll try to give some pointers about 23 cm that will help make you invest your money and time better.

Band Characteristics

First off, let's consider the position of 23 cm. It's the next allocation above 33 cm (902 MHz) and is harmonically related to 144 and 432 MHz (1296 MHz/3 = 432; 1296/9 = 144). Its position in the amateur spectrum and its propagation characteristics truly qualify it as a microwave frequency!

Typical installations here involve high-gain directional antennas, high path loss, and low-noise GaAsFET preamplifiers and receiver front ends. At this frequency, the limiting factor regarding receiver noise figure is the noise generated by the receiver itself.

Average signal propagation can be as little as one mile, using 1-Watt hand-helds on FM simplex. This assumes a clear shot between the stations, since objects such as buildings, trees, billboards, and hills will greatly attenuate (if not block) the signals. In many cases, some of these obstructions will act to reflect the signal (and even refract it, to a lesser degree), resulting in the raspiness common to received multipath signals. (Some operators reflect signals off of airplanes passing overhead for brief long-haul DX contacts.) With high-gain antenna arrays and the best receiving equipment, the average range can be extended considerably to more than 50-60 miles—even 100 miles under ideal conditions.

At 23 cm, precipitation can play havoc with your signals. It's not unusual to have virtually all of your 1296 efforts dissipated by a dense, moisture-laden cloud not far away. Mountaintop operators know this phenomenon well, especially when caught in rainstorms (or even snowstorms)!

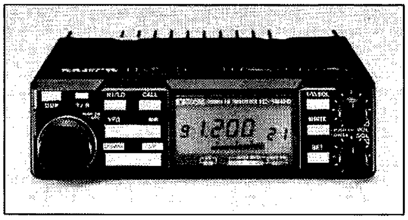


Photo A. ICOM's IC-1200 1.2-GHz mobile transceiver.

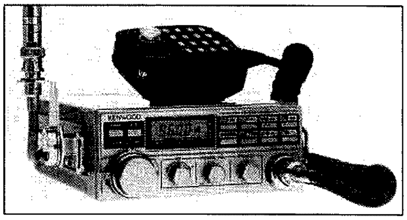


Photo B. Kenwood's TR-50 1.2-GHz portable transceiver.

Additionally, layers of snow, ice, and even raindrops on 23-cm yagi antennas will detune the elements, resulting in all kinds of wild swr readings. These effects are virtually unheard of on 50 and 144 MHz. On the other hand, the same conditions that spawned those rain clouds will often produce some of the more exciting propagation seen on the band, and it goes by the nickname "tropo."

Tropo

Vastly extended 23-cm propagation can occur via tropospheric ducting, which is present when a layer of cooler air is trapped between two layers of warmer air in the troposphere (that's the "sphere" that produces all of our weather). This is called an inversion, wherein the air temperature actually rises with an increase in altitude, and is very common in the mid to late summer and fall.

When ducting occurs, signals entering the duct can be carried for many miles beyond their normal range. To give you an example, such a duct often forms between Hawaii and higher elevations along the California coast, and has resulted in two-way contacts on 144, 220, 432, and even 1296 MHz.

Several years ago, a strong duct was formed by a severe storm off the Carolina coast during the 1984 ARRL September VHF QSO Party. Stations were working from Connecticut into Florida on 432, and from western Massachusetts into Georgia on 1296 MHz.

Indeed, this past November we were treated to a tremendous opening from the Midwest to the East Coast, and stations in Nebraska, Kansas, and Oklahoma worked stations in Ohio, New Jersey, and New York—all the way up to 23 cm. Some contacts on 23 cm were made with as little as 2 Watts of output!

Equipment Considerations

Okay, I've convinced you. There is something going on up there! What's the best way to get on? There are a few options, so let's start by discussing equipment first. At the present time, there are four major companies (to my knowledge) offering ready-to-go transceivers or transverters for 23 cm. I suspect that more will come on line as Novice activity picks up. (Remember that your Novice privileges at 23 cm restrict you to 5 Watts output!)

ICOM of America offers perhaps the broadest line of radios, with a hand-held, a mobile transceiver, and a base-station multimode. The IC-12AT operates FM only with 1 Watt of output, while the IC-1200A delivers 10 Watts from a mobile package. And, of course, ICOM makes the 10-Watt IC-1271A, a multimode radio offering FM, SSB, CW, and ATV (reviewed in the September, 1986, issue of *73*).

The ICOM line is nice in that it covers all possible angles of 23-cm operation. It would seem that FM takes the priority over other modes, and I'm sure this is a reflection of

Photo C. Two transverters for 23 cm, Microwave Modules' MMT 1296/144 (top) and SSB Electronics' LT23S (bottom).

Photo D. Comparison of a 23-element 1296-MHz yagi beam (top) with a 9-element 144-MHz yagi beam (bottom).

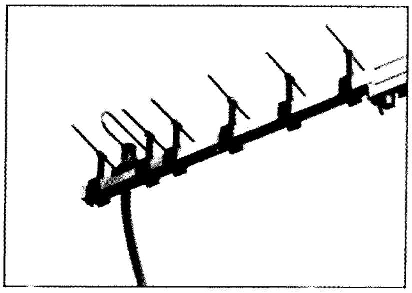


Photo E. Close-up of the dipole driven element on the 1296-MHz yagi beam. Note the small size and the method of element support.

23-cm FM activity in Japan. But if you're into fast-scan amateur television, SSB, CW weak-signal work, or even satellite operation, then the 1271A will fit the bill.

Kenwood at the present time markets only a 1-Watt FM portable for 23 cm, the TR-50. This unit is battery-powered and offers coverage of the Novice segment in a shoulder-carried configuration. However, folks at Kenwood assure me that a hand-held, mobile rig, and multimode will be available for 23 cm in the near future.

For those of you better equipped with HF gear and 2-meter multimodes, a quick and easy way to get on 23 cm is to use the transverter route. Microwave Modules of Liverpool, England, has offered a nice 2-Watt transverter for 1296 MHz for some time. The front end is a GaAsFET, and all transceive switching is on-board. Microwave Modules also offers a companion 15-Watt power amplifier for a little "kick." The i-f is on 2 meters, so you'll need a source of energy at 144–148 MHz to make it work.

As the MMT 1296/144 comes from the factory, the conversion is from 144 to 1296 MHz. However, simply changing the local oscillator crystal would result in a different conversion frequency. For example: Changing the stock 96-MHz LO crystal to 94 MHz would allow coverage of the 1272–1276-MHz range, with an i-f of 144–148 MHz. Using 95 MHz would permit coverage of the 1284–1288-MHz range.

Another manufacturer of high-quality 23-cm products is SSB Electronics of West Germany, who make the famous LT23S linear transverter. This unit is a staple of microwave operation in the U.S., and in addition to its 10-Watt output, it features a dual-crystal switch for the LO. This gives you two choices of frequency coverage at the flip of a switch. The LT23S also features a GaAsFET front end, but you will have to come up with your own antenna-switching scheme as separate connections are made for 1296-MHz rf OUT and rf. Incidentally, 28-MHz i-f schemes are also available for use with the "Transverter" connection on your HF radio—an easy way to go!

Antenna Considerations

Now that I've reviewed the products, let's look at feedlines and antennas. Most conventional transmission lines are useless at this frequency, with the standard RG-8/U showing about 10-dB loss per 100-foot run. This means that if you are feeding 10 Watts up your 100-foot tower, about 1 Watt will be available to the antennas. Fortunately, Belden introduced the now-famous type 9913 semi-rigid coaxial cable, which checks in a bit better at about 6-dB loss per 100 feet. Now you have 2.5 Watts to work with instead of 1! (Any victory, however small. . . .)

Of course, you can select rigid transmission lines such as Prodelin Spir-O-Line or Andrew Heliax cable in diameters of up to 1-5/8". The more common sizes are 1/2" and 7/8", but be prepared to spend a few dollars for it. Using 100 feet of 7/8" Heliax, for example, would cut your losses to about 3 dB per 100 feet, giving you 5 of the original 10 Watts to work with. You'll pay a steep price for it, though—about $3 a foot! My advice? Stay with 9913. It's easy to use, readily available, and inexpensive (from 40–50¢/foot), and connectors for it are also inexpensive, easy to use, and readily available.

Using type N fittings here is a must. Specially made N connectors are available from different sources including Amphenol. The RF Connection in Maryland makes a particularly nice center pin for Kings type N connectors to use with this cable. If you employ the standard PL-259 connectors—even with Teflon™ dielectric—be prepared to see 1.5-dB loss in the connector. A PL-259 looks nothing like 50 Ohms at this frequency, so stay away from 'em.

Another good choice for low-power applications is the time-tested BNC connector. It's also cheap, easy to use, and plentiful. Best of all, it looks like 50 Ohms way beyond 23 cm!

Antennas, antennas. Here you have a few choices. Larsen Antennas (of Kul-Rod fame)

MANUFACTURERS OF 23-CM RADIO EQUIPMENT AND ANTENNAS

ICOM America, Inc.
2380-116th Ave. N.E.
Bellevue WA 98004
1, 2, 3, 6

Microwave Modules, Ltd.
North American Distributor:
The PX Shack
52 Stonewyck Drive
Belle Mead NJ 08502
3, 4, 5, 6

Mirage/KLM Communications
PO Box 1000
Morgan Hill CA 95037
7

Down East Microwave
Box 1655A RFD #1
Burnham ME 04922
3, 4, 9

Larsen Electronics, Inc.
11611 N.E. 50th Avenue
PO Box 1799
Vancouver WA 98668
10

F9FT Antennes Tonna
The PX Shack
52 Stonewyck Drive
Belle Mead NJ 08502
7, 8

SSB Electronik
North American Distributor:
Transverters Unlimited
PO Box 6286 Station A
Toronto, Ontario M5W 1P3
3, 4, 5, 6

Trio-Kenwood Communications
1111 West Walnut Street
Compton CA 90220
1

Jaybeam, Ltd.
Spectrum International
PO Box 1084
Concord MA 01742
9

Key to 23-cm Equipment

1 FM transceivers
2 SSB/CW transceivers
3 Linear transverters
4 Rf power amplifiers
5 Receiving converters
6 Preamplifiers
7 Yagi antennas
8 Stacking frames
9 Loop yagis
10 Mobile and base vertical antennas

Segment	Use
1240–1246	ATV
1246–1248	NBFM, digital, duplex links
1248–1252	Digital
1252–1258	ATV
1258–1260	NBFM, digital, duplex links
1260–1270	Wideband experimental, satellite uplinks
1270–1276	Repeater inputs every 25 kHz
1276–1282	ATV
1282–1288	Repeater outputs every 25 kHz
1288–1294	Wideband experimental, ATV
1294–1295	Narrowband FM simplex, 25-kHz channels
1294.5	National FM simplex calling frequency
1295–1297	Weak-signal SSB, CW
1297–1300	Digital communications

Table 1. The current 1240–1300-MHz ARRL band plan adopted in 1985 (Novice subband indicated in italics).

makes an excellent collinear antenna for 1200–1300 MHz, employing either magnetic or fixed mounts. These NMO series antennas employ a special Belden type 9311 cable about the size of RG-58, with a loss rating of 16 dB/100 ft. The supplied coaxial cable is about 17 feet in length, so you are talking perhaps 3-dB total losses in a mobile installation. Gain is comparable to a collinear on lower frequencies, typically in the range of 4–5 dB due to the low angle of radiation.

For extended-range communications, consider a yagi (or several of them!). Many manufacturers offer high-performance beams for 23 cm, among them KLM, Tonna, Jaybeam, and Down East Microwave.

The KLM and Tonna designs are of a more conventional straight-element type, with KLM producing an 18-dB, 44-element yagi, and Tonna producing 23- and 55-element versions. The yagis from Down East are of the loop type and are available in 45-element configurations. The reason for the loop design is to eliminate the effects of water droplets or ice particles hanging from the elements (which degrades performance). Jaybeams are also of the loop variety and come in two versions.

Remember, of course, that most FM communications will employ vertical polarization, and most weak-signal work will use horizontal polarization. (At 23 cm, polarization losses can be in the 50–60-dB range!) All things considered, I suggest the single yagi approach for starters. One antenna, one feedline, and (hopefully) one radio to keep it simple. After you acquire some experience on 23 cm, you can decide how best to upgrade your station and antennas.

Remember also that you are working with microwave energy, so be careful! The FCC specified the 5-Watt power level for safety reasons, so use common sense. Don't make it a practice to stand in front of yagi antennas while transmitting. These antennas quite often have 20 dB or more gain at 23 cm, so your 5 Watts at the feedpoint become more like 500 Watts erp (effective radiated power)! As far as FM operation goes, I don't see a real problem with hand-helds running 1 Watt or less.

Operating Considerations

Now for the $64,000 question: Just who can I work on 23 cm, anyway? Admittedly a legitimate question, what with 25 MHz of spectrum space available and very little activity at present. Most operation on 23 cm occurs during contests and most of that is SSB/CW on or near the national weak-signal calling frequency of 1296.100 MHz. The current 1240–1300-MHz ARRL band plan, adopted in 1985, is shown in Table 1.

By viewing the table, you can see that there's plenty of spectrum space for a variety of interests, from exotic wideband modes to amateur television (ATV), digital modes such as packet, satellite modes such as OSCAR mode L (uplink at 1268 MHz), and, of course, narrowband FM and weak-signal work. As mentioned earlier, the predominant modes are SSB and CW around 1296.100, but this has been largely due to availability of equipment, with most of those operators using transverters or home-brew transmit and receive converters.

I would hope that a subband adjacent to the national calling frequency at 1296.100 would be redesignated for Novice weak-signal work. The reasons are quite obvious: Any radio equipment tuned to peak performance at 1296 will yield satisfactory results at 1295 or 1294 MHz. The same would apply to antennas as we are talking a variation of less than .25% in frequency. Also, higher-class licensees currently active on 1296 could, with minimal effort, switch downward to 1294 MHz by installing a different crystal in transverters. Of course, stations with multimodes such as the IC-1271A would be able to make the excursion easily.

In summary, the 23-cm band presents numerous opportunities for both newly licensed Novices and seasoned higher-class amateurs. There hasn't been a better time to get state-of-the-art equipment and antennas, either. If you still aren't sure, try and find a local ham who's already active on 23 cm. He'll probably be glad to share his knowledge with you. (I don't know anyone on 23 cm who wouldn't like to see a little more activity on the band, especially during contests!) See you on 23! ■

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THE DIGITAL NOVICE

K9EI covers the basics and terminology of a ham's digital world—from Samuel Morse's basement to packet proficiency.

The news is out and it is good news indeed! The FCC has significantly enhanced the operating privileges of over 80,000 existing Novices (Technicians also can use the new Novice privileges). The most obvious addition is the reinstatement of some voice privileges for Novices. Yes, reinstatement is the right word. Back in the days before air and water, Novices had a two-meter voice band. Yours truly operated regularly as KN9EIV back in 1961.

This time around it's much better. . . SSB operation on a portion of the 10-meter band (28.3–28.5 MHz) and "all modes" on the 222.10–223.91-MHz band. Additionally, the entire band from 1270 to 1295 megahertz is available to Novices.

While handie-talkies are selling like hotcakes for the new bands and Novices are crowding onto the SSB subband on ten, a vast new world of additional modes is beckoning the newcomer to some exciting challenges.

Digital Privileges

It's popular to say these days that Novices have been granted "digital privileges." The truth is, Novices have enjoyed digital communication for many years. For a long time, it was the only mode they were permitted!

Though it may not be fashionable to think in these terms, Morse code is an early form of digital transmission. It has laid the groundwork for far more complicated systems. The best place to start, as they say, is at the beginning, so let's take a quick sweep through history and find out how we got to where we are today. It's going to be a quick ride, so hang on.

Pre-Morse

Let's go back thousands of years ago and look in on Joe and Jane Caveperson. Things were pretty simple then. Spoken language consisted of a few grunts and an occasional whomp on the head with an early form of the Wouff-Hong. Chances are very good, though, that at some point they felt a need to "count" things. Fingers and toes make a good way to keep track of things as long as there aren't too many things. Each finger or toe represents the same quantity. It's not an accident that in modern times we refer to these appendages as "digits." In reality, Joe and Jane were already involved in "digital" computing.

S.F.B. Morse

It would be a number of years before any significant change would take place in digital communication. In the 1800s Samuel Morse would introduce a simple electronic system for sending messages over large distances. Interestingly, the original Morse system actually used a "teleprinter" of sorts rather than relying directly on human interception of his code. An early form of chart recorder placed a moving paper tape under a pen. As a signal was received, the pen came in contact with the paper leaving a series of "marks" and "spaces." An operator could then look at the paper tape and "read" the message.

Later systems involved the use of nothing but a sounding unit. The story goes that some operators developed the talent of copying messages with the pen units by listening directly to the sound made as the pen moved up and down. Regardless, what Morse did was to create an electronic system of communication using combinations of on and off signaling. That's one of the basic rules for digital communication.

You must be able to reduce the transmission to one of two states. Morse's system did that. The special combination of dits and dahs that form Morse code are derived from a set of rules defining each element and how they are assembled into words and messages. In modern terms, **protocol** is the word we use to describe those rules.

When radio experimenters began having success, Morse code was a natural way to communicate by radio waves. It would be a few years before voice transmissions would become commonplace. In modified form, Morse code reigned supreme.

Teletype

It is the nature of the human race to want to do things more easily and communicators are no exception. Several things happened that resulted in what we now call **Teletype™**. (Although the word has come to be used generically, Teletype is a registered trademark.)

Telegraphers and experimenters including a man named Baudot were searching for a way to group several code transmissions together over a single landline circuit. Baudot invented a system that was a form of time-sharing allowing five operators to all use the same circuit. It consisted of a rotor system that passed over a metal ring broken into five parts. A similar device was placed on each end and synchronized so that the circuit was available to each operator in rotation for a short period of time. Crude, but effective.

The desire to have a real teletypewriter led ultimately to using Baudot's system in a slightly different way. Rather than using Morse's code, a system of signaling was created that required exactly five elements to create every character. Through binary arithmetic we can see that 32 distinct combinations can be created with such a code. That's enough to cover all of the alphabet and some of the numbers. By designating one of the combinations as a shift code, a separate letters case and figures case was created, almost doubling the number of combinations available.

A few other things come into play when we talk about Teletype techniques. First, remember that each element within each character is sent sequentially. The individual elements flow one after another in a **serial** fashion. Additionally, you can start and stop sending characters at any time with a standard Teletype system. When characters can start at any time, the system is called **asynchronous**. It is necessary to let the receiving station know when a character is going to begin, so an additional bit of information is required, called a start bit, at the beginning of every letter sent.

Finally, mechanical machines are very hard to keep in close tolerance. Inventors found that the addition of one or more stop bits at the end of each character allowed the mechanics of the receiving machine to get ready for the next character.

The system just described is still in wide use today, though computer devices have replaced the mechanical machines for the most part. Standard amateur speeds include 60-word-per-minute and 100-wpm teletype. Radioteletype (abbreviated as **RTTY**) is the first "new" digital mode that is now open to Novices on the 28-, 221-, and 1270-MHz bands.

More Bits

Particularly as computers became a reality

in the business world, a real need existed for a code similar to Baudot or Teletype code (also known as Murray Code) that allowed more combinations. American Standard Code for Information Interchange, or **ASCII**, is the result. It is a seven-bit code that allows 128 separate combinations. An eighth bit can be used for some rudimentary error-checking. Modern computer designers have elected to use the eighth bit to designate an additional 128 characters, often used for special control signals and graphics. In practical operation, ASCII sounds just like RTTY and remains a serial, asynchronous form of communication. It's also available to the digital Novice on the same bands already mentioned. It opens up the possibility for easy computer program exchange over paths that aren't subject to noise. Line-of-sight communication on 221 would be a good choice, for example.

While all of this is nice, what about all the really modern things you've read about? They are yours, too, and here's a brief rundown on the basics.

AMTOR

Maritime interests have long used Teletype circuits and Morse to relay messages from ship to shore. Commercial interests were frustrated by poor conditions that often required manual retransmission of messages. They longed for a way to automatically recognize errors and correct them "on-the-fly." Amateurs were intrigued by the possibility, too, and created something called **AMTOR** for Amateur Teletype Over Radio.

AMTOR is a seven-bit code with a difference. It is designed so that there must always be a balance of four marks (or ones) to three spaces (or zeros) in each character. That stipulation reduces the number of characters available to just about that of standard Baudot transmissions. It makes it easy to spot errors, however, since the wrong combination results in the receiving system marking the character invalid.

Secondly, AMTOR is a synchronous system. The transmitting and receiving station must stay locked together in near perfect harmony. In simple terms, a short block of characters is transmitted, then the sending station pauses and listens for an acknowledgment. If everything is OK, the next group is sent; if everything's not OK, the bad block is repeated until it is acknowledged.

A control code allows the stations to switch roles between master and slave, allowing both the chance to transmit. What you hear on the air sounds like two birds chirping at each other.

AMTOR can also be used by Novices, but it's not the easiest mode to use. While several packages are available for popular home computers, there are some timing problems that can easily come into play either in the computer itself or in your particular radio. If you are considering AMTOR, you might want to see it in operation before investing. There are hardware AMTOR units available that are highly reliable, but they come at a premium price.

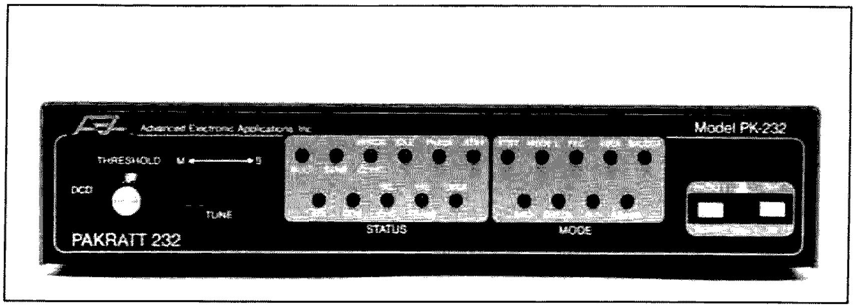

Photo A. AEA's PK-232 is an example of a station controller that allows you to operate all digital modes with a computer. The PK-232 can operate VHF and HF packet, CW, RTTY, ASCII, and AMTOR.

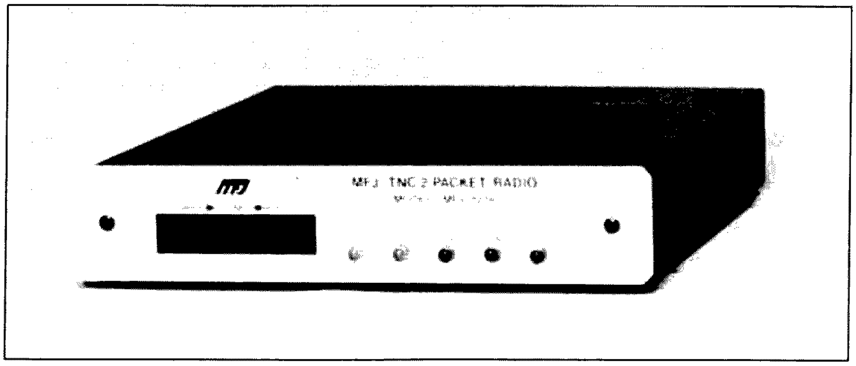

Photo B. MFJ's 1274 is an example of a packet terminal node controller (TNC). It is equipped to operate both HF and VHF packet.

A second AMTOR mode does allow for one-way bulletin-type transmissions. AMTOR Mode B, as it is called, uses a form of "Forward Error Correction." Mode B does allow for a higher degree of reliability than standard RTTY, but not as great as Mode A (which was described before).

Packet

Unless you have been hiding under a rock, packet radio has no doubt come to your attention. What is it? Well here's a brief introduction to get you started.

First of all, packet uses synchronous transmission techniques. Each character or unit of information has a distinct time slot. Exact timing between stations is required. Fortunately that's not too hard to do. Rather than using start and stop bits as standard Baudot does, something called a **flag** is attached to the beginning and end of each group of data. It's nothing more than a special combination of zeros and ones that has been reserved for this special use. Special circuitry is able to pick out the "clock rate" or speed from the signal itself so that the receiving station can stay synchronized to the transmitting station.

Flags are used in lieu of start signals. Rather than each character having an individual beginning element, a large block of information begins with a flag instead. In common amateur practice, 128 or even 256 characters can follow a single flag. Even larger blocks are possible.

Every bit that follows a flag signal has a unique time period. If no information is available for transmission, a null signal must still be sent to ensure the proper timing. As a result, it is common in such synchronous systems to buffer the transmitted data (store the entire message in computer memory before establishing contact) to eliminate wasted time on the air.

It is important to note that the information that follows the flag can be anything. It can indeed be ASCII characters, and most packet operation today consists of such transmissions. It could just as easily be binary program information for a computer or, for whatever reason you might want to do it, it could be Baudot or any other code. This kind of versatility opens up the possibility for visual image transmission and even digital audio. Wayne is still waiting for a report of the first transmission of digital audio via packet! It surely can't be far away.

With what I have described, we have a completely viable communication system, but it is not packet radio. We simply have a synchronous communication path. If we agree, by standard, to set aside a certain number of bits of information following each flag for special information, we begin to create the system we call packet radio.

One of the key ingredients in this special information is something called the **Frame Check Sequence** or **FCS**. Remember that we are buffering all of our transmitted data. By applying some sophisticated mathematics to the data, an all but unique number can be generated. That number, the FCS, is included in the transmission. On the receiving end,

the same calculation is made. If the FCS numbers match, the data is considered valid and allowed to pass on to the screen or printer. If not, the receiving station does not acknowledge that particular block of data. After a short period of time, the transmitting station will resend the data, still looking for an acknowledgment.

The **AX.25** protocol is the set of rules generally used in amateur circles today. A second protocol called Vancouver is popular in some areas of the world. It was created by early digital experimenters in Canada. Keep in mind that one protocol is not inherently better than the other. It is simply a matter of convention that AX.25 is in wider use.

The term packet radio comes from the idea that information destined for the same location is grouped together in packages or "packets" before transmission!

Much, much more goes into the specifics of packet radio protocol, but if you understand the simple concepts I've outlined here, you are sure to know more than the majority of old-timers already.

What Now?

What else can you do as a digital Novice? The possibilities are probably only limited by your imagination. Keep in mind that while at the present time it isn't a digital mode, you can even operate a fast-scan television station on the 1270-MHz band! Up there, you can do anything the Extra-class licensees can do, only with reduced power. You also can't be the control operator for a repeater, but you can operate through them.

Let's take a very quick look at what you need to experiment with some of your new privileges. Chances are good that you already own a personal computer. Most *73* readers do. If that is the case, you'll need a hardware interface, often called a terminal unit (TU) or computer patch, to match your computer signals to your radio. You'll also need some software capable of operation on your mode or modes of choice. If packet is what you are really interested in, the best way to go is with a special radio modem called a terminal node controller (TNC). While a TNC is a very sophisticated form of modem, it is one of the best dollar values on the market today. For not much more than $100, you can purchase a state-of-the-art unit!

Universal modems that allow all digital modes with virtually any home computer are becoming very popular and I'm sure that Novice enhancement will add fuel to the fire. They tend to be somewhat more expensive, but are often worth the price if you want to try everything available to you.

If you don't own a personal computer or any interface equipment yet, don't be afraid to search out an old VIC-20 in the flea market. While it does have some limitations, you can still use it quite effectively with your new privileges. While other low-price machines certainly will work, they often aren't supported with the same wide variety of software and information.

I told you it was going to be a quick trip through the digital modes! I hope you got a feel for the way in which digital communication has developed, and some of the basics involved in each mode. Most importantly, I hope you will get involved. Just because other folks may be using state-of-the-art packet systems doesn't mean you and your buddies can't experiment with straight ASCII transmissions. You don't need a new computer system. The one you have will work fine—or you can make a minimal investment in somebody else's castoffs. In many cases, you might even find an "Elmer" willing to loan you an old unit that he/she isn't using any longer.

If you are looking for more information, check the old issues of *73*. Most of the popular interfaces and software have been reviewed over the last few years. My own books (see below) may be of help. Get involved! Enjoy the new privileges, and show off what you can do to your family and friends.

Remember, Sam Morse was a digital communicator . . . and you are too! ■

Jim Grubbs K9EI is the author of The Digital Novice *and* Get *** CONNECTED to Packet Radio. *Both are available from QSKY Publishing, PO Box 3042, Springfield IL 62708. This article copyright 1987 by Jim Grubbs K9EI.*

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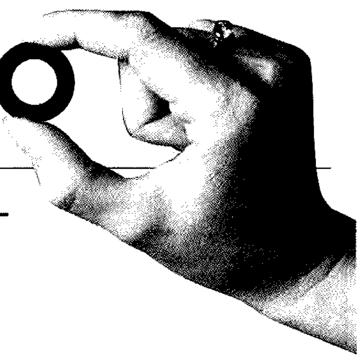
Tune In 220



Convert GE's MASTR-PRO receiver to 220 MHz—it's as easy as winding a few coils.

As most 220-MHz repeater owners and users are well aware, there is a very limited source of high-quality commercial FM receivers for this band. The GE MASTR-PRO UHF receiver (type ER-42[X]) makes an excellent 220-MHz repeater, mobile, or base-station receiver after this relatively simple conversion, which can easily be accomplished over a weekend. The converted receiver has excellent sensitivity and front-end selectivity, and it retains all of the other qualities of the original unit.

The easiest version to convert is the 406–420-MHz unit. However, the 450–470-MHz and 470–512-MHz versions require only a little more effort. Note that some versions of the 406–420-MHz units are designed for wideband FM use (±15-kHz deviation). These units should be perfect for packet radio use in the high-speed digital "backbone" networks that are in the planning/construction stages in some parts of the country.

Conversion

The main part of this conversion consists of replacing the coils in the helical resonators in the receiver front end. A few other minor changes can be made to optimize sensitivity after the resonator coils have been changed. Caution: Make certain the receiver is functioning properly on the original frequency before you start the conversion. If there are any problems, correct them first!

To gain ready access to the coils and to make the job of changing them easier, first remove the frame from around the receiver casting. Remove all mounting screws, including the power and antenna connector mounting screws. Remove the cover plate from the top of the casting, exposing the resonator coils. It will also simplify the job if you remove the i-f/audio/squelch board by unplugging the cable harness from the pins on the board.

Wind new coils for all of the helical resonators according to Table 1. Use #12 bare copper wire (it need not be enamel-covered). Wind the new coils around a 1/2-inch-diameter rod and adjust the turn spacing so the coils are the same length as the original coils that are being replaced. The completed coils should have an inside diameter of about 33/64" (slightly over 1/2").

To remove the old coils and install the new ones, mount the receiver casting in a vise and direct the flame from a home-type propane torch directly at the solder mounting point of each coil. Be careful to direct the flame away from any nearby wiring. After a few seconds, the old coil will drop out of its mounting hole.

Remove the solder lugs from the tapped coils and slide them onto the replacement coils. Pre-tin the lead of the replacement coil and install it in position, being careful to center the coil in the middle of the resonator cavity. Removal of the old coils and installation of the new ones will be easier if you first either remove the tuning discs or screw them flush against the bottom of the cavity.

After all resonator coils have been changed, screw the tuning discs in toward the open end of the coils and carefully bend the coils so the discs will turn inside the coils up to about 1/2 coil turn without touching the coils. Remove the output coupling link (L432) from the last multiplier resonator and replace it with a longer link to increase the amount of coupling and LO injection (see Fig. 1). Adjust the link so it comes close to the coil without touching it.

If the original receiver was intended to tune the 450–512-MHz range, some fixed capacitors in the LO/multiplier chain will have to be changed. Replace these caps with values shown on the schematic for the 406–420-MHz version of this receiver. If your receiver is the 406–420 version, ignore this step. The

Coil #	Function	Number of Turns	Tap (Turns Above Gnd.)
L410/412	Antenna input	7-1/4	1/2
L411/413	Rf amplifier input	7-1/4	3/8
L414/419	Rf amplifier output	7	1/4
L415/420	Rf interstage	7-1/4	None
L416/421	Rf interstage	7-1/4	None
L417/422	Rf interstage	7-1/4	None
L418/423	Mixer input	7	1-1/8
L424/426	Last multiplier collector	7	3/8
L425/427	Last multiplier output to mixer	7-1/4	None

Table 1. Coil data.

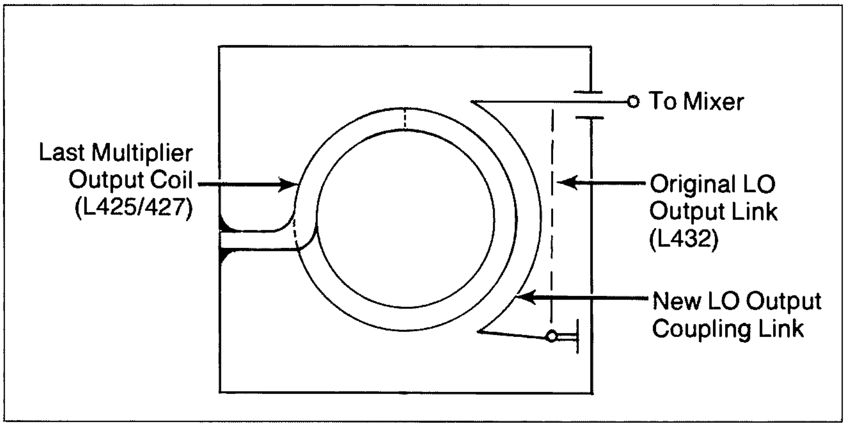


Fig. 1. Output coupling link adjustment.

caps in question are: C6/C7 or C40/C41 across T1–T2 or T7–T8 on the oscillator board (should be 39 pF), C2/C3 across L1 on the multiplier board (should be 30 pF), C5/C6 across L2 on the multiplier board (should be 6 pF), and C7/C8 across L2 on the multiplier board (should be 20 pF).

This completes the conversion process. Reassemble the receiver frame and install the i-f/audio/squelch board. Replace the cover over the helical resonators, but use only two or three screws to attach the cover if you intend to do any diddling with the coil taps.

Tune-up

The crystal formula is different from the original since the last multiplier stage in the LO/multiplier chain (A413/A414 [Q2], originally an X2 multiplier) now operates straight through as a buffer. The new crystal formula is: $F_{Xtal} = (F_{Oper.} - 12.4) / 12$ MHz. If you operate in the 220.5–225.0-MHz amateur band, the crystal will fall in the range of 17.3417 to 17.7167 MHz. All other crystal correlation data is unchanged.

Now align the receiver in the normal manner. You might be able to improve sensitivity by adjusting the positions of some of the coil taps or by adjusting the spacing of the coupling link from the output of the last multiplier resonator coil (L432) to the first mixer. The tap positions listed in Table 1 were determined by experimentation.

> ***"The main part of this conversion consists of replacing the coils in the helical resonators in the receiver front end."***

After you align and "diddle" with the receiver, sensitivity is about 0.25 uV for 20 dB of quieting on a U.H.S. receiver (the receiver with an rf amplifier stage—A410/A411). It has been suggested that the coupling apertures between resonator cavities may not be the correct size for minimum insertion loss/optimum selectivity at 220 MHz. I have not experimented with this and would be happy to hear from anyone who does try to optimize the coupling.

Note: Be sure to label the receiver to indicate that it has been converted, because there is no external visible evidence to reveal that the unit has been modified! Schematic diagrams or instruction manuals for these receivers are frequently available at hamfests, usually from people selling surplus FM gear.

That's it! I have converted several of these, and they all work fine. The first guinea pig is being used on the Maryland FM Association's 222.16/223.76-MHz repeater input at Jessup, Maryland, and is performing exceptionally well. I hope yours is equally successful. ■

novice enhancement
BUYER'S GUIDE

At 0001 UTC on March 21, 1987, Novices ceased to be the second-class CW citizens of the amateur airwaves. The average Novice operator can now open his mouth to do something other than curse the powers that created a Morse-only Novice license.

Novice privileges on 80, 40, and 15 meters remain unchanged. The new Novice privileges are as follows:

28.1–28.3 MHz	**CW, RTTY; 200 W PEP**
28.3–28.5 MHz	**CW, SSB; 200 W PEP**
222.1–223.91 MHz	**All Privileges*; 25 W PEP**
1270–1295 MHz	**All Privileges*; 5 W PEP**

*** Novices are not permitted to be repeater control operators.**

The buyer's guide that follows is our attempt to show the "enhanced" Novice what equipment is available for these new bands and modes. Manufacturers are still scrambling to develop equipment to tap the large Novice market, so this is just a taste of things to come.

ICOM

ICOM currently produces the largest line of equipment for the enhanced Novice.

220 MHz

The IC-3AT is ICOM's 220 version of their most popular hand-held, the 2AT. The 3AT features thumbwheel frequency selection and 1.5 Watts output.

The IC-03AT is ICOM's deluxe 220 hand-held, featuring 10 full-function memories, scanning, 32 built-in subaudible tones, 3 Watts output (with an option for 5 Watts), and an LCD readout. Frequency entry is via DTMF keypad.

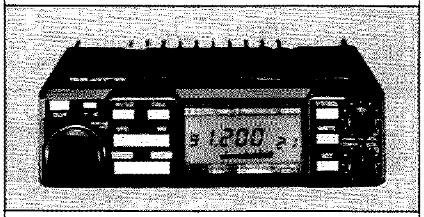
The IC-37A is ICOM's "slim line" 25-Watt 220 mobile transceiver with 9 memories, 32 PL frequencies, four scanning systems (memory scan, band scan, program scan, and priority scan), and an LED readout. The 37A comes with a DTMF mike with up/down frequency and memory scan.

The IC-38A is ICOM's new 25-Watt mobile rig with controls designed to suit the mobile environment. It has a large LCD display, 21 memories, receive coverage of 215–230 MHz, scanning, and memory lock-out.

The IC-375A is a 25-Watt all-mode base-station transceiver for 220. The 375A covers 216–230 MHz and has 99 tunable full-function memories, passband tuning, notch filter, noise blanker, built-in swr bridge, and semi- or full-break-in CW. It has an amber LCD and a multi-function meter. Four scanning systems are available: band, programmable, mode, and memory scan with programmable lock-out. Subaudible tones are built-in, as are standard repeater splits. The 375A will be available in June 1987.

1.2 GHz

The IC-12AT is a 1-Watt hand-held that covers 1260–1300 MHz. The 12AT has 10 memory channels and has both program and memory-channel scan. It allows programming of 32 subaudible tones.



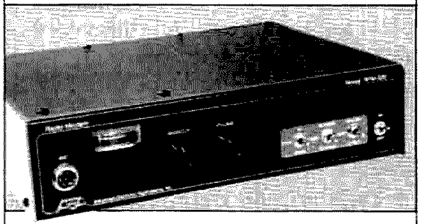
The IC-1200 is a 10-Watt mobile 1.2-GHz transceiver. The 1200 covers 1240–1300 MHz and features a large LCD readout with automatic dimmer, 21 memory channels, all subaudible tones built-in, and frequency/memory scan. It also incorporates ICOM's AFC (automatic frequency control) function, which automatically adjusts the receive frequency to the frequency of the transmitting station.

The IC-1271A is a 10-Watt base-station multimode transceiver for 1.2 GHz. It has 32 memory channels, scanning, and an LED display. The 1271A can be used for SSB, CW, and FM (including ATV). Front-end GaAsFETs provide exceptional receive sensitivity.

28 MHz

ICOM produces four HF transceivers that cover the 10-meter band: IC-735, IC-745, IC-751A, and IC-761.

For more information about these ICOM products, please contact your local ICOM dealer directly.



AEA

Advanced Electronic Applications, Inc., has announced their model RFM-220 9600-baud modem radio for the 220-MHz band. The RFM-220 is a synthesized transceiver that covers the entire 220-MHz band. It will operate at data rates from 0 to 9600 baud using external data controllers like the AEA PK-232 and PK-87. The CPU-controlled synthesizer allows 100 memory channels with memory scan and band scan. All synthesizer functions are remote-controllable. In addition to its data handling capabilities, the RFM is also a high-fidelity voice transceiver with deviation settable from 4 to 10 kHz. Sensitivity, selectivity, and dynamic range are achieved using a GaAsFET front end and multiple helical resonators. Power output is adjustable from 1 to 30 Watts. The RFM-220's price is expected to be about $600.

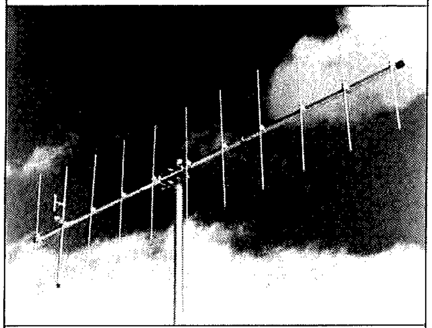
AEA has also announced their new 10-meter SSB/CW hand-held, the MX-28S. The MX-28S offers two variable crystal oscillators with operating ranges of 50 kHz each. The unit comes with crystals for 28.250–28.300 and 28.300–28.350 MHz (other crystal ranges are available for a nominal cost). It has an S-meter/output power meter and a noise blanker. CW operation can be accomplished using the built-in push-button or an external key/keyer. External speaker and mike jacks are provided. When used with the standard telescopic antenna, it provides respectable portable DX performance. Portable 10-meter data operation is also possible with the MX-28S when it is used

with a portable computer and data controller. Power is derived from 6 AA drycells or 7 AA NiCds. The MX-28S's price is expected to be $300.

For more information about these new AEA offerings, circle number 213 on your Reader Service card.

CUSHCRAFT

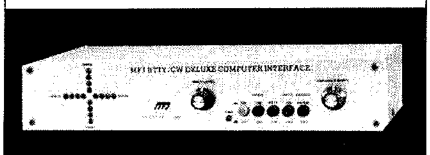
The Cushcraft A220-7 is a 7-element 220-MHz directional beam designed for FM and vertical polarization. The A220-7 is rear-end mounted so it can be put on a mast or tower leg. Forward gain is 11.0 dBd and front-to-back ratio (average) is 20 dB.



The Cushcraft A220-11 is an 11-element 220-MHz directional beam. Forward gain is 13.2 dBd and front-to-back ratio is 20 dB. It features the Reddi-Match system, which provides for easy tuning and a hassle-free 50-Ohm feed.

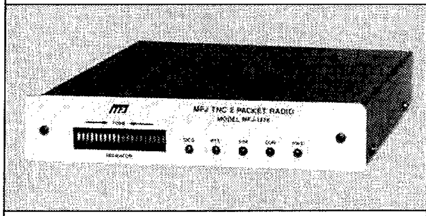
Cushcraft's 10-3CD and 10-4CD Skywalker 10-meter beams are yagis that have been computer-designed to have maximum gain and minimum sidelobes and swr. These lightweight antennas can be installed by one person. Forward gains for the 3CD and 4CD are 8 and 10 dBd, respectively, and bandwidths are 700 and 600 kHz, respectively.

Cushcraft also produces a full line of 220-MHz mobile and portable antennas, as well as multiband HF beams which can be used in the 10-meter Novice subband. For more information about Cushcraft antennas, circle number 214 on your Reader Service card.



MFJ

MFJ offers a wide variety of products for the enhanced Novice. The MFJ RTTY/CW Computer Interface allows you to send and receive RTTY, ASCII, AMTOR, and CW. A crosshair mark/space LED tuning array allows for accurate tuning even under poor S/N conditions. It transmits on both 170- and 850-Hz shift and includes a built-in RS-232 interface. Variable shift tuning lets you copy any shift from 100–1000 Hz and any speed (5–100 wpm RTTY/CW, 300 baud ASCII). The unit works with VIC-20/C-64, Apple, CoCo, Atari, TI-99, and other computers. It can be used with MFJ, Kantronics, AEA, or other software. This unit is priced at $179.95.



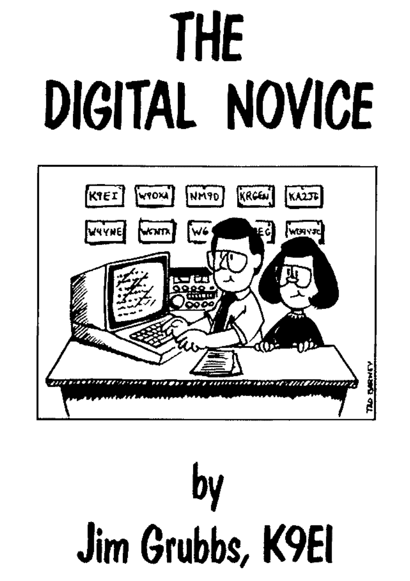
The MFJ-1274 is a full-featured packet radio VHF/HF TAPR TNC-2 clone that includes an LED tuning indicator, a TTL serial port, and a lithium-battery memory backup. All you need to operate the 1274 is your rig, any computer with an RS-232 serial port, and a terminal program. Speeds in excess of 56K baud are possible with a suitable external modem. If you have a VIC-20/C-64/C-128, you can purchase an optional starter pack for $20 that includes interfacing cables and terminal software. The MFJ-1274 retails for $169.95.

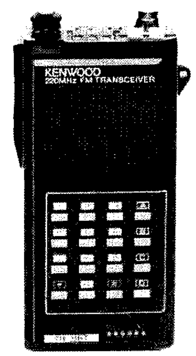
For more information about these MFJ products, circle number 215 on your Reader Service card.

QSKY PUBLISHING

Jim Grubbs K9EI has released *The Digital Novice*, a primer on data communication for beginners. This book covers every digital mode from Morse through packet, explaining in detail how each mode works and its suitability for the Novice operator. The book is 128 pages and costs $12.45 ppd.

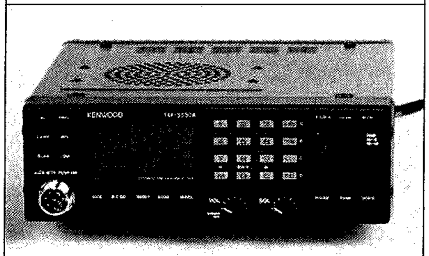
For more information about *The Digital Novice*, circle number 216 on your Reader Service card.



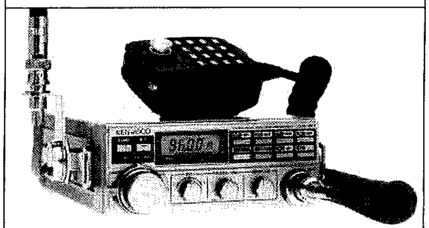


KENWOOD

The TH-31BT is Kenwood's compact 1-Watt 220-MHz hand-held. Weighing only 8 oz., the 31BT has thumbwheel frequency selection, a DTMF keypad, and CTCSS tone switches. Standard repeater offsets are controlled by a simple switch. Standard accessories include a wall charger and a 180-mAh battery pack.



The Kenwood TM-3530A is a 25-Watt 220-MHz mobile/portable transceiver that features 15 seven-digit telephone number memories, automatic repeater offset selection, direct keyboard frequency entry, 23 memory channels, large multi-colored LCD, 16-key DTMF keypad, frequency lock switch, and GaAsFET front end. The 3530A (reviewed in this issue) is also suitable for base-station use.

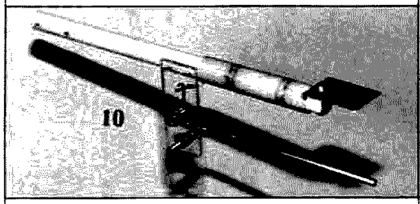


Kenwood's TR-50 1-Watt portable 1.2-GHz transceiver features an LCD frequency readout, an S/rf power meter, 5 memory channels, and a 16-key DTMF microphone. The TR-50 comes with a shoulder strap, which makes it easier to take this microwave rig into the mountains.

Kenwood also covers the 10-meter band with a complete line of multiband HF transceivers.

For more information about these Ken-

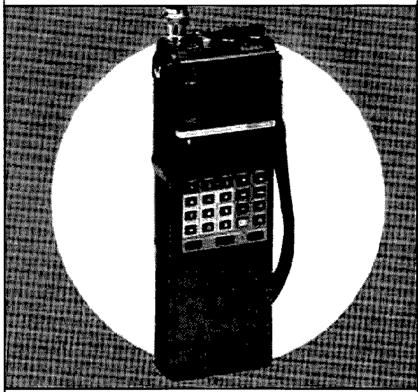
wood products, contact your local Kenwood dealer directly.



BILAL

Bilal Isotron antennas allow you to operate on the HF bands without requiring a lot of room for antennas. Isotrons transmit as well as half-wave dipoles and have been tested at 3 dB less noise on reception compared to a half-wave dipole. The 10-meter Isotron measures 16″ x 1-1/2″ x 4″ and weighs only 1-1/2 pounds. It has a 1-MHz bandwidth and can handle 2 kW PEP. It is priced at $29.95 plus $3.50 s&h. Isotrons are also available for 80, 40, and 15 meters.

For more information about the Bilal Isotrons, circle number 217 on your Reader Service card.



YAESU

The FT-109RH is Yaesu's new 5-Watt 220-MHz hand-held. It covers 220–225 MHz in 5-kHz or 10-kHz steps. Features include 10 memories, battery saver, standard 1.6-MHz or nonstandard offset, and memory and priority scanning. It is equipped with a DTMF tone generator, front-panel multimeter, and a VOX system. Optional accessories are interchangeable with other units in the 109/209/709 series.

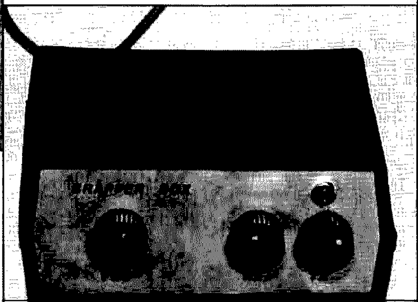
Yaesu also covers the 10-meter band with a complete line of multiband HF transceivers.

For more information about the Yaesu FT-109RH, circle number 218 on your Reader Service card.

SHURE

The Shure model 526T Series II Super Punch® is a transistorized base-station microphone that can be used to replace ceramic or dynamic high- or low-impedance microphones. The 526T features an adjustable volume control, a momentary or locking PTT switch, a transistorized preamplifier, excellent SSB response, low hum pickup, minimal susceptibility to RFI, and a universal six-wire cable for quick connection. It runs on a standard 9-volt battery.

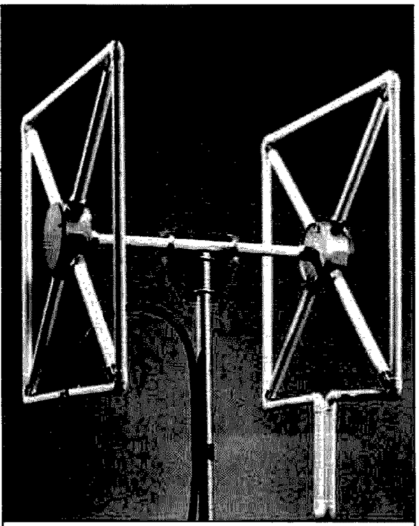
For more information about the complete line of Shure microphones, circle number 219 on your Reader Service card.



ELECTRON PROCESSING

The Brapper Box from Electron Processing, Inc., is a peripheral that ensures TNC compatibility with any amateur rig while at the same time protecting the rig. The Brapper Box is installed between the TNC and the radio. Audio level sent to the rig from the TNC, as well as audio sent to the TNC from the rig, is precisely controllable from the front panel. Packet audio levels can be preset using panel-mounted pots. Internal reed relay keying protects the TNC's keying transistor from transients and reversed-polarity PTT lines, while making it easy to use a TNC with any radio (without using R-C networks or audio coupling transformers).

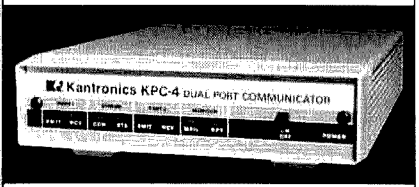
For more information about the Brapper Box, circle number 220 on your Reader Service card.



ACOA

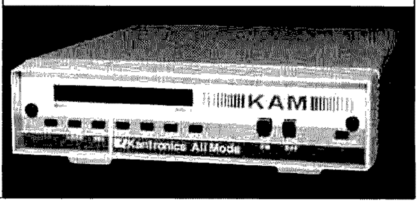
The Antenna Company of America offers a cubical quad antenna for 220 MHz. It is of all-metal construction (except for the insulators), can be quickly and easily assembled, and requires no field adjustments. The antenna is fed with 50-Ohm coax and can handle 5 kW. It is also lightweight (less than 9 pounds), allowing it to be rotated using a light-duty rotor (e.g., one designed for TV antennas). The ACOA cubical quad for 220 MHz is priced at $159. ACOA also makes cubical quads for 144 MHz and 440 MHz.

For more information about ACOA antennas, circle number 221 on your Reader Service card.

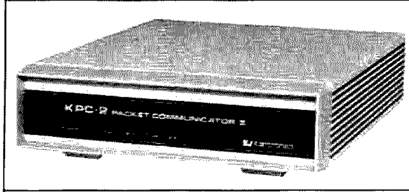


KANTRONICS

The Kantronics KPC-4 dual-port communicator features two fully functional packet ports, digipeating on each port, and gateway between ports. You can bridge two frequencies on one band or operate crossband. Each port includes a watchdog timer. The KPC-4 contains Kantronics' Personal Packet Mailbox feature, which allows you and others to leave and collect messages. RS-232/TTL terminal interfacing provides compatibility to all computers. The KPC-4 has a 32K RAM, a 32K EPROM, and a 512-byte EEPROM. The KPC-4 retails for $329.

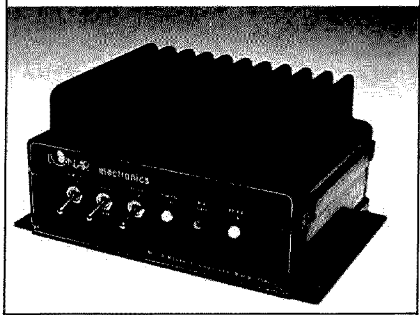


The Kantronics All Mode (KAM) communicator lets you operate VHF and HF packet, CW, RTTY, ASCII, and AMTOR all with one unit. The KAM features bar-graph tuning, user-programmable mark and space tones for RTTY/HF packet, and limiter/limiterless operation on HF for weak-signal work. KAM's CW demodulator is center-frequency and bandwidth programmable. The KAM has a 32K RAM, a 256K EPROM, and an EEPROM for parameter storage. The KAM retails for $319.



The Kantronics KPC-2 packet communicator allows you to work VHF/HF packet with any computer. The KPC-2 features a built-in HF and VHF modem, full-duplex operation, and multiple connect capabilities. It operates at 300, 400, 600, and 1200 baud. The KPC-2 retails for $169.

For more information about these Kantronics products, circle number 222 on your Reader Service card.



LUNAR

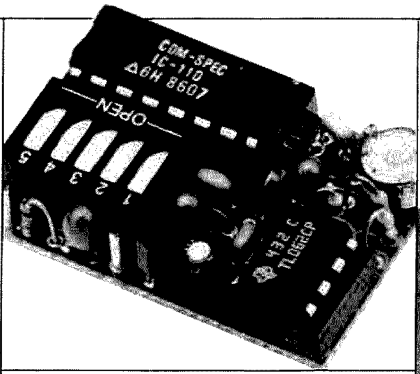
The Lunar Industries, Inc., model 1.3M4-30P is a 220-MHz linear amplifier designed specifically for 220 handie-talkie owners. This solid-state power amplifier will boost a 2-Watt HT output to 22 Watts, and the built-in preamp circuit will allow you to copy weaker repeaters or simplex signals. The 1.3M4-30P operates from 13.8 V dc and retails for $139.95.

Lunar's model PAI-28 is an automatic, switching-type, 14-dB preamplifier for 10 meters. The PAI-28 improves effective receiver sensitivity and requires 12 V dc and a short coax cable between radio and antenna. Lunar's 10-meter preamp retails for $49.95.

For more information about these Lunar products, circle number 223 on your Reader Service card.

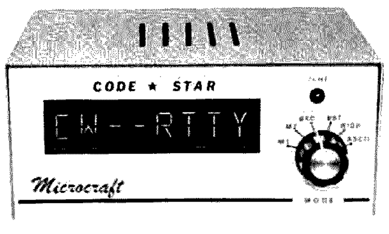
COMMUNICATIONS SPECIALISTS

The SS-32PA encoder is the latest in a



wide range of tone products offered by Communications Specialists, Inc. The board can be installed in a wide range of radios not already equipped with a subaudible tone squelch system. The SS-32PA is capable of producing 32 CTCSS tone frequencies, which are selected with a DIP switch on the board. For nonstandard tones, the SS-32P can be factory programmed for any tone frequency up to 256 Hz.

To receive a free copy of the CSI product list, circle number 224 on your Reader Service card.



MICROCRAFT

Microcraft's CODE*STAR decodes incoming Morse, Baudot, and ASCII transmissions and displays them on eight large LEDs. A microcomputer auto-tracks Morse from 3 to 70 wpm. An agc circuit provides up to 16 dB of gain to help maintain signals under fading conditions. A built-in code-practice oscillator is also included. An optional serial/parallel output port provides fully buffered simultaneous parallel and serial ASCII. Data rate is either 110 or 300 baud; electrical interface is either 20 mA or TTL/RS-232.

For more information about the CODE*STAR, circle number 225 on your Reader Service card.

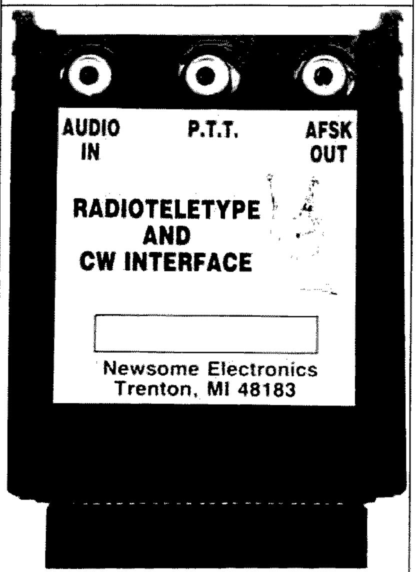
WI-COMM

A narrowband preamplifier for the 220-MHz band has been introduced by WI-COMM Electronics, Inc. The model NLA62M preamplifier covers 210–230 MHz and, due to its filter-like bandpass response, can survive the worst possible overload. A 3.5-dB noise figure, together with a 3rd-order intercept point, guarantees a high spurious-free dynamic range. Gain is 20 dB typical, and a 1-dB gain compression level is 21 dBm. Input/output vswr is 1.5:1. The NLA62M is housed in a blue die-cast aluminum case and has BNC female connectors.

For more information about this WI-COMM product, circle number 226 on your Reader Service card.

NEWSOME ELECTRONICS

An interface/terminal unit for Commodore computer owners is available from Newsome Electronics. This RTTY/CW interface can send/receive five speeds of RTTY, two speeds of ASCII, and CW up to 100 wpm. Features include a 3K write-ahead buffer and 26 user-defined call-up message spots of 3K each. All incoming text can be saved to memory, and a searchable logging system is included. A code-practice program is also built-in. There is no additional software to buy; a disk drive is not required. Compatible with VIC-20/C-64/C-128 only.



"Pakmon" is a ROM program that enables reception of 1200-baud VHF packet radio. Features of the two plug-in modules include automatic memory save of all incoming text and recall on command. Compatible with VIC-20/C-64/C-128 only.

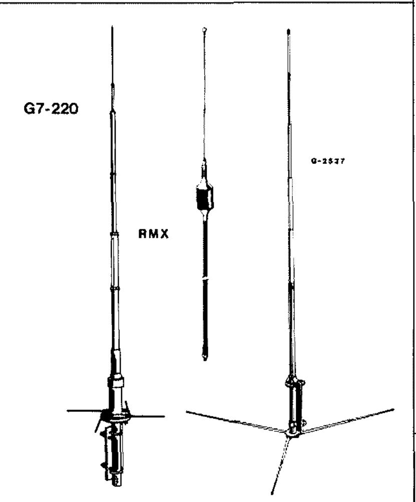
For more information about these Newsome Electronics products, circle number 227 on your Reader Service card.

HUSTLER

The CGT-220 is Hustler's ultimate 220-

MHz mobile antenna. A collinear design creates 5.2 dB of gain. The CGT-220 includes a trunk-lip mount with swivel ball and 17′ of coax. The antenna only is available as model CG-220.

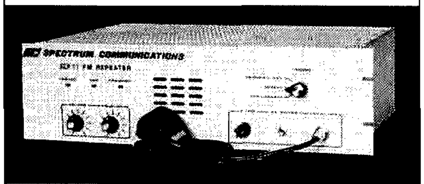
Hustler's G7-220 is a 220-MHz vertical antenna with 7 dB of gain compared to a half-wave dipole. The G7-220 is 10′2″ tall and weighs 7 pounds. It is intended for repeater or home use.



The G-2537 is Hustler's 10-meter omnidirectional antenna that offers more gain than a 5/8- or 1/2-wave antenna. An extended collinear .64-wavelength radiator increases the coverage available from a vertical antenna by as much as 20%. Full-length radials ensure complete rf decoupling and a low angle of radiation. Bandwidth is 1 MHz and power rating is 300 Watts. The 19′8″ G-2537 is shunt-fed/dc grounded for lightning protection.

The RMX is a 10-meter mobile antenna that combines Hustler's Super Resonator coil with a shortened mast to create an antenna that is only 46″ tall. A stainless-steel spring above the coil provides impact protection. The RMX's bandwidth is 400 kHz under 2:1, and its power rating is 1,000 Watts.

For more information about Hustler antennas, circle number 228 on your Reader Service card.



SPECTRUM COMMUNICATIONS

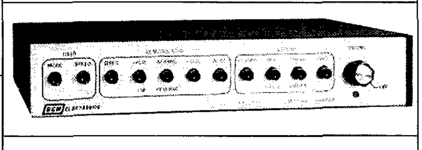
The SCR77 from Spectrum Communications Corp. is a basic, low-cost, 30-Watt 220-MHz repeater for voice or packet. Features include excellent receiver sensitivity (.22 uV/12 dB Sinad), an 8-pole front-end filter, a double-balanced mixer for superior intermod rejection, a 12- or 14-pole i-f filter, a built-in plug-in CW IDer, a timeout timer, and automatic switchover to battery backup. An optional rack-mount autopatch is available.

The SCR1000A is Spectrum Communication's deluxe 65-Watt 220-MHz repeater. In addition to the features listed for the SCR77, it includes a courtesy tone, "kerchunk killer," and touchtone remote control functions. All important operating parameters are adjustable and measurable from the front panel. Custom-designed options are available.

For more information about repeaters from Spectrum Communications, circle number 229 on your Reader Service card.

DGM ELECTRONICS

The MKB-2000 Morse keyboard from DGM allows you to send perfect code from 1–199 wpm just by typing the characters. It has a 500-character text buffer, ten 40-character programmable memories, and a random code generator. The MKB-200 has outputs to key any transceiver.



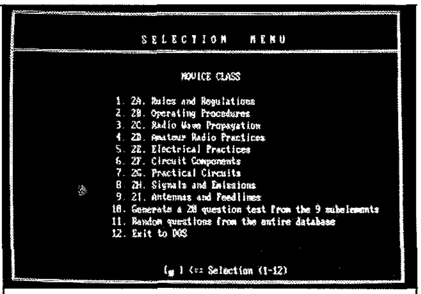
DGM's RT-1200 receive terminal will copy Baudot, ASCII, and Morse and display the text on a video monitor. A built-in demodulator will copy 17-, 425-, and 850-Hz shift RTTY signals using either high or low tone pairs. An on-screen status line displays mode, speed, and demodulator status. A Morse speed indicator is also included.

The DGM-1 RTTY/CW computer interface allows you to use your computer with your transceiver. The DGM-1 has a sensitive demodulator that will copy 170-, 425-, and 850-Hz RTTY signals and 800-Hz CW signals. The unit provides AFSK and FSK outputs for RTTY and keyed outputs for CW. An LED bar-graph tuning indicator is included. Computer connection is made via RS-232/TTL.

For more information about these DGM products, circle number 230 on your Reader Service card.

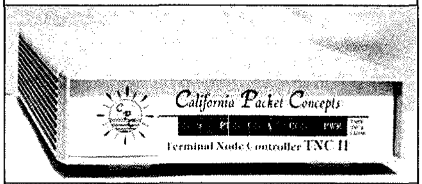
HEATHKIT

Heathkit has updated its computer assisted instruction (CAI) software to reflect the changes caused by Novice Enhancement.



This PC-compatible software offers FCC-approved questions for all license classes. Users can create sample tests containing multiple choice questions and a CW practice program.

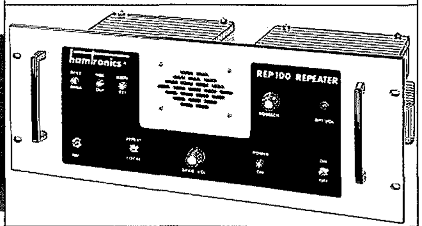
For more information, circle number 231 on your Reader Service card.



CALIFORNIA PACKET CONCEPTS

The TNC II from California Packet Concepts is a licensed copy of the TAPR TNC-2. TAPR's original design is kept intact to offer absolute compatibility with software updates and new network offerings. All sockets use dual beam gold contact. Each TNC II is burned in for 48 hours prior to shipment. The latest 1.1.4 software is available and the TNC II comes standard with all headers installed.

For more information about the TNC II, circle number 232 on your Reader Service card.



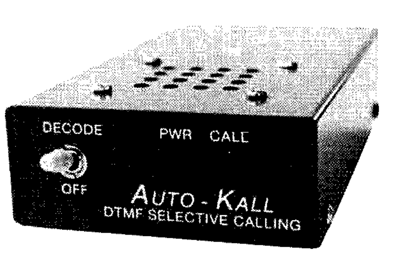
HAMTRONICS

The model REP 100 220-MHz repeater from Hamtronics, Inc., is available in either kit ($630) or wired-and-tested ($880) form. Although Novices cannot be repeater control operators, a repeater promotes 220 activity and makes the band much more exciting.

For more information about Hamtronics repeaters, circle number 233 on your Reader Service card.

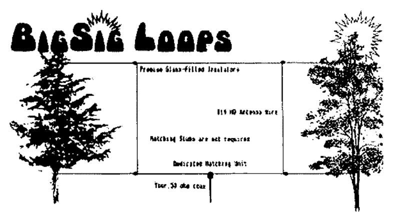
MOTRON

The AK-10 Auto-Kall from Motron is a DTMF/touchtone decoder that can be attached to your 220-MHz or 1.2-GHz



transceiver. The AK-10 mutes the speaker until a caller keys in your personal three-digit touchtone code. The speaker resets to silent standby if you're not around to receive the call—an LED is lit to let you know that someone called. Your personal code is entered via three small 16-position rotary switches. To install the AK-10, all you have to do is plug in the supplied autopatch cord into your external speaker jack. The AK-10 retails for $89.95 plus $3 s&h.

For more information about the AK-10, circle number 234 on your Reader Service card.



THE RADIO WORKS

The BigSig Loop from The Radio Works is a high-performance, low-cost 3/2-wavelength loop for 10 meters. The 13′ square BigSig comes with a dedicated matching unit that matches the loop to 50-Ohm coax. The BigSig is easy to get up and get going.

The Radio Works sells many other antennas for 10 and 220 MHz. For a free catalog, circle number 235 on your Reader Service card.

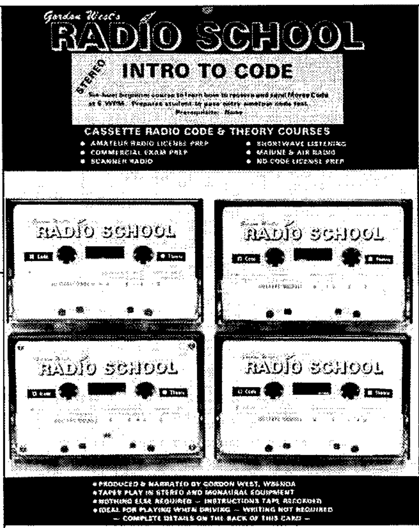
BUTTERNUT

The model 220CV-5 is Butternut's omnidirectional 5-dB-gain vertical antenna for 220 MHz. Butternut's Trombone™ phasing sections offer high gain and reliability under the most severe weather conditions. There are no coils or internal connections that can pull apart, and no insulators that can break. It is fed by means of an adjustable gamma match for lowest swr. Resonant radials decouple the radiator and its supporting structure and feedline to suppress unwanted high-angle radiation.

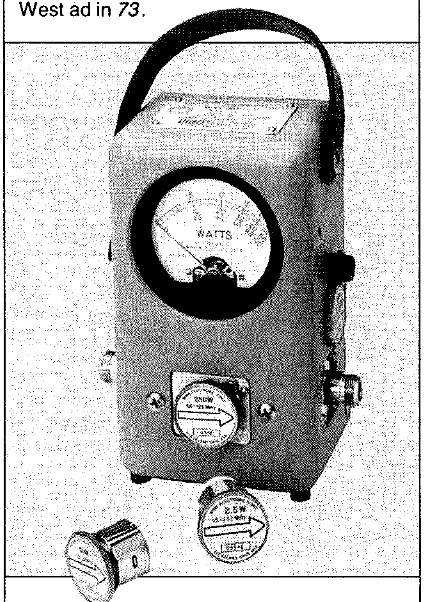
For more information about the Butternut 220CV-5, contact your local Butternut dealer directly.

GORDON WEST

The Complete Voice Novice from Gordon West Radio School is a set of study materials



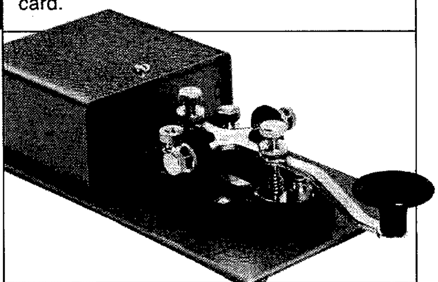
to be used in preparing for the new Novice exam. The package includes four Morse code tapes, two theory tapes, the ARRL's *Tune in the World*, an FCC rule book, a code oscillator and key, instructions for proper code sending, 300 FCC Novice test questions, FCC Form 610, VEC examiner lists, a confidential written exam and ten 5-wpm tests for the examiners, and instructions for the examiners. All materials have been updated to reflect the new Novice Enhancement testing requirements. The Complete Voice Novice retails for $49.95 plus $5 s&h. Gordon West Radio School promises that you'll pass your Novice exam or your money back. For more information, contact your local ham radio retailer or look for the Gordon West ad in *73*.



BIRD

The Novice must be able to know the power output of his transmitter to match his antenna system and to stay within legal limits. The Bird Model 43 wattmeter is expandable to measure power in every amateur band from 1.8 MHz through 2300 MHz, from milliwatts through the legal limit.

For more information about the Bird 43, circle number 236 on your Reader Service card.



NYE-VIKING

Before you can use your new Novice voice privileges, you have to earn them. The Nye-Viking code practice set is built for the beginner. It includes standard key, oscillator, amplifier, and 2″ speaker—all mounted on a base with non-skid feet. It gives you chirp-free keying and can be reused with any transmitter.

For more information, circle number 239 on your Reader Service card.

RADIO AMATEUR *CALLBOOK*

Want to QSL those new phone contacts? The 1987 North American and International *Callbook*s list the calls, names, and mailing addresses for over 950,000 licensed amateurs around the world. In addition, they include international postal information, worldwide QSL bureaus, standard time charts, prefixes of the world, a census of amateur licenses in each country, and more.

For more information about the *Callbook*, circle number 238 on your Reader Service card.

THE LANZ COMPANY

A complete Novice study guide and code practice program is available on-disk for the C-64/C-128 computers from The Lanz Company. This program includes the FCC pool of questions, formulas, schematic symbols, sample tests, random code, and sample QSOs. This program retails for $19.95 ($29.90 with printing disk).

A 5 through 30 wpm code practice program is available on either disk or data cassette tape for $9.95. A Novice study guide is available on audio cassette tape for $10.95; a 5–7-wpm code tape is available for $5.95. A 5–16-wpm code practice video tape (VHS) is available for $15.95.

For more information about these products, circle number 240 on your Reader Service card.

COTEC

Amateur radio software for the Apple II family of computers is available from COTEC. Connections between the radio equipment and the computer are through shielded

audio cables to the cassette ports of the Apple. The software demodulates the tone information and converts it to timing signals. These, in turn, are converted to ASCII data that the computer can display as text. A software phase-locked loop is used to synchronize with and decode the incoming signal. For transmission, tones are sent from the cassette output to the transmitter microphone input.

Code Machine ($29.95) is COTEC's Morse terminal program. Frequency tracking is fully automatic from 600 Hz to 1300 Hz. Speed is from 10–60 wpm. The Code Machine software features a 24,000-character receive buffer, a 320-character type-ahead transmit buffer, a 255-character text buffer, and a 24,000-character text buffer. It allows variable spacing between characters.

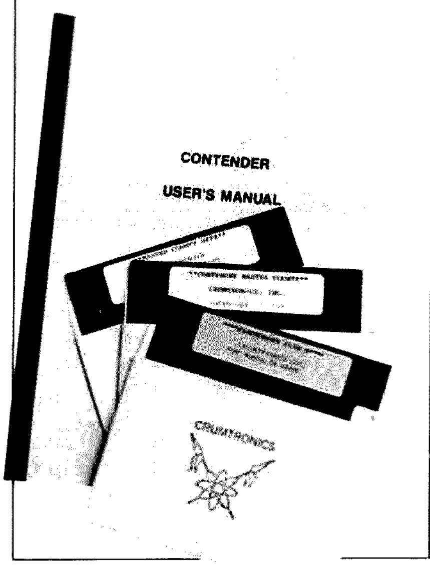
RTTY Machine ($29.95) is COTEC's RTTY terminal unit. It runs at 60 wpm. All audio frequency processing is done in the software. RTTY Machine has a 24,000-character receive buffer and transmits in three ways: (1) each character is sent as a key is pressed, (2) a 255-character transmit buffer is sent, (3) a 24,000-character transmit buffer is sent. All forms of transmission are encoded to Baudot and sent to the cassette outputs as mark (2125 Hz) and space (2295 Hz) tones. When fed into the microphone of an FM transmitter, this produces AFSK. When fed into an SSB transceiver, this produces FSK offset from the indicated frequency by the mark/space frequencies.

For more information about Apple software from COTEC, circle number 241 on your Reader Service card.

CRUMTRONICS

The Contender Plus II is a computerized logging and awards record keeping system for the Commodore 64/128. Automatic logging features include time/date, band/mode, and QSO number. Printer options include QSL cards, labels, dupe sheets, and awards summaries.

For more information, circle number 242 on your Reader Service card.

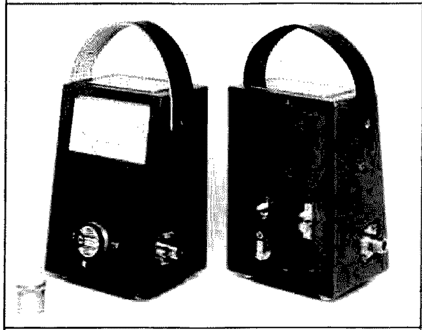


AMATEUR RADIO SCHOOL

The KB6MT Amateur Radio School code course teaches you code using a character sending rate of 21 wpm (spacing between characters is decreased as you progress through the course). Rhythm patterns are memorized (rhythm patterns don't exist below 17 wpm) and the course is designed to take you from 0 to 21 wpm—regardless of what level you start at. The cost for 4-1/2 hours of taped code instructions and code practice, including a written manual, is $20.

Theory courses on cassettes for each license class are also available, as are simulated VEC code tests at 13 and 20 wpm.

For more information, circle number 243 on your Reader Service card.



COAXIAL DYNAMICS

The model 81000A wattmeter from Coaxial Dynamics, Inc., measures rf power in 50-Ohm coaxial cables and transmission lines. The built-in line section can be removed and used with accessory cables from 33" to 200' from the meter. On the back are two sockets for storing extra measuring elements. The 81000A covers from 0.1 Watts to 5,000 Watts full scale, and from 2 to 1000 MHz.

For more information, circle number 244 on your Reader Service card.

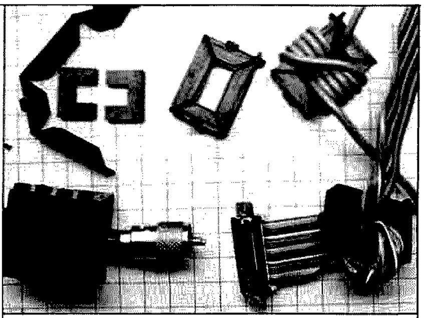
KALT & ASSOCIATES

DIGIPAC I is digital communications software for PCs and compatibles from Kalt & Associates. In addition to full message forms and a pop-up help system, DIGIPAC I features include split-screen, ASCII/binary file transfers, macro keys, macro files, DOS shell, character and line buffer mode, auto line-feed, screen/recall printer, and disk logging. DIGIPAC I is priced at $49.95 plus $3 s&h.

For more information, circle number 246 on your Reader Service card.

COMPUTERADIO

Novices on 10 meters can greatly attenuate interference to TV and hi-fi equipment using Snap-On-Choke from Computeradio.



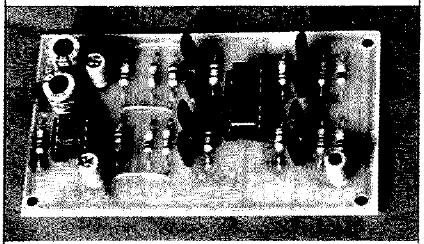
The device consists of a two-piece ferrite core and a plastic clamp. It is effective within a 0.5–200-MHz range and can be clamped onto cables of up to 10 mm in diameter. Installation doesn't require removing connectors and desoldering connections. A single choke is $4; a package of four is $15 (prices do not include s&h).

For more information, circle number 245 on your Reader Service card.

AZIMUTH

The model WT-80A world time clock features digital readouts of both local time and world time. A 24-position slider is used to select which part of the world you would like local time for, and UTC is shown with the slider on London. This world time clock is priced at $19.95 plus $1.95.

For more information, circle number 247 on your Reader Service card.



BEL-TEK

The CW-1 active CW filter kit from BEL-TEK has selectable bandwidths of 90, 130, and 200 Hz with a center frequency of 800 Hz. It has a built-in audio amplifier to directly drive a loudspeaker. The CW-1 is powered by a 9-volt battery and retails for $19.95.

For more information, circle number 248 on your Reader Service card.

TOP CLAIMED SCORES—1987 WORLD SSB CHAMPIONSHIPS

10 METERS

Single-op

Call	QSOs	States/Provinces	DX	Total Score
VP9AD	1,487	45	10	411,675
KD8AQ	549	39	1	107,250
AA4LE	537	36	0	96,660
K1NYK	525	32	3	92,050
N3II	386	40	5	87,300

Multi-op

Call	QSOs	States/Provinces	DX	Total Score
N4EJV	941	44	3	219,255
KB4RXM	623	42	6	151,920
K5LZO	572	43	7	137,000
N2EOC	532	40	4	117,260
KA5DLM	431	35	2	79,735

20 METERS

Single-op

Call	QSOs	States/Provinces	DX	Total Score
VO1SA	1,328	61	97	1,605,280
NR5M	1,328	56	60	1,069,520
4Z7T	792	41	110	845,900
OK3CMZ	840	52	53	754,425
KA1GG	879	53	60	731,110

Multi-op

Call	QSOs	States/Provinces	DX	Total Score
NO9H	741	54	59	638,450
K3IVD	596	50	53	428,995
JA9YBA	430	44	44	373,120
W7MR	419	45	33	229,710
KØKU	378	42	26	142,800

40 METERS

Single-op

Call	QSOs	States/Provinces	DX	Total Score
KP4FI	1,233	53	89	1,400,830
KE5CV	1,756	56	43	928,620
KJ4CQ	1,196	56	18	451,770
8P9AF	447	40	53	329,685
KS9O	858	56	17	320,105

Multi-op

Call	QSOs	States/Provinces	DX	Total Score
W2ZQ	1,177	55	21	460,940
KB4RXM	1,152	55	8	365,400
NT5D	847	55	8	327,000
KS3F	851	54	19	316,455
NK7U	849	56	14	301,700

75 METERS

Single-op

Call	QSOs	States/Provinces	DX	Total Score
NP4P	669	55	49	428,480
KQ3V	641	58	38	336,960
KE5FI	680	56	37	332,940
K5ZD/1	651	55	37	329,360
KØHA	795	58	18	309,700

Multi-op

Call	QSOs	States/Provinces	DX	Total Score
K2PM	1,310	59	56	890,100
W7MR	689	57	16	257,325
KS3F	698	57	14	249,920
KB9S	640	56	12	219,300
KB4RXM	608	54	4	177,480

160 METERS

Single-op

Call	QSOs	States/Provinces	DX	Total Score
WB9HAD	1,783	59	40	915,255
KE5FI	1,010	58	25	428,280
W9UP	919	58	5	289,800
ADØO	862	57	10	289,775
VE3XN	748	58	11	261,510

Multi-op

Call	QSOs	States/Provinces	DX	Total Score
WB8IFP	1,494	58	27	653,225
KC1U	1,256	57	25	529,720
KC8P	1,091	57	18	414,000
WB8IGY	1,066	54	11	348,400
WA4JXI	571	56	33	322,180

WEATHERSAT

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STATION AUTOMATION

The subject for this month is automatic control of your station. It is a fact of life that most of the interesting activity in terms of weather satellites happens during the day. It is also a sad fact of economic life that most of us are tied up for five days out of every seven doing what it takes to help house and feed the family, pay the bills, and last but not least, upgrade the satellite station!

Once you are truly hooked on this hobby, it is hard to limit yourself to looking at pictures just on weekends, particularly in a perverse world where the most interesting frontal patterns, monstrous hurricanes, eclipses of the sun, or whatever appear to occur during the prime working hours. The solution, of course, is to use some of your hardware to get around the problem of how to acquire pictures when you aren't around to push all the buttons.

To many, the automation of a station conjures up visions of a completely automatic tracking system. Granted, with the computers and accessory hardware available today, it is entirely possible to construct an auto-tracking system driven directly from a computer.

That computer can be working with several satellites at once, and when each one comes over the horizon, based on the computer's determination of the orbit, the system could switch your receiver to the correct frequency, turn on the tape recorder, and track the antenna for the duration of the pass. The system would then shut down until the next spacecraft was expected.

Although this type of system is quite practical and need not be particularly expensive, essentially equivalent results can be obtained with far less effort. The key, in terms of the polar orbiters, is to use an omnidirectional antenna, such as the one in the *WSH*, that doesn't require tracking. With modern preamps, mounted at the antenna, the results with an omni-antenna can be quite reliable and will save all the fuss and bother of a larger directional array, elevation and azimuth rotors, and the interfaces to control them.

All the discussions relative to polar-orbit satellites that follow will assume the use of an omni-antenna system. Let's look at a range of options from the simple to the complex.

Single-Event System

The simplest system is one designed to acquire a single picture or pass each day. You might wish to tape a GOES visible-light frame or the best visible pass of-the day for a specific polar orbiter.

Your best friend in this case is one of the newer digital appliance timers. These are designed to turn lamps and other appliances on and off at a particular time. They are like the old-fashioned clockwork timers but are accurate to a fraction of a second compared to the 15-minute resolution that could be expected with the mechanical systems.

For several years now I have used a Micronta 63-886 24-hour timer that was sold by Radio Shack; many equivalent models are available almost anywhere. These days there is a big market for these devices in home security to turn your house lights on and off, and some of the more elaborate models can be programmed for different on and off times each day over a period of a week or more.

The use of such a timer simply involves setting the receiver to the proper frequency, setting your tape recorder to record, and using the timer to turn the tape system on and then off at precisely the time you want. In the case of a WEFAX frame or sequence of frames, I usually program the system to come on about a minute prior to the scheduled time and then set the "off" time for about two minutes after the end of the last frame I want. You could easily record the prime visible-light frame from GOES throughout an entire two-week vacation using this very simple technique.

A single-event system works just as well for polar orbiters, although there is a bit more work since NOAAs and METEORs don't follow a uniform daily schedule like GOES. Their orbits do provide a schedule, however, that can be interpreted with even more accuracy if you have some basic predict information.

Let's say you are using a program like PREDICT from the *WSH*. It tells you that your favorite polar-orbiting bird will be making an overhead pass tomorrow, crossing 262 W at 1259:48 UTC. There is no need to go to the plotting board to figure what out times have to be. If you use a period of 102 minutes, it is obvious that the satellite traverses 360 degrees (one orbit) in 102 minutes—about 3.53 degrees per minute.

Since a crossing at 262 degrees W is a descending pass for North America, the satellite is going to have to travel almost halfway around the world to get overhead. Let's say you reside at 40° N. If the satellite had to travel from equator to equator, it would travel 180° in its orbit, but to get to the overhead point for your station, it must travel 180 − 40 or 140 degrees along its track. At 3.53 degrees each minute, this would require about 40 minutes (140/3.53 = 39.66 minutes).

If you assume the reference crossing to be at about 1300 (rounding off the actual value to the nearest minute), the satellite will be overhead at about 1340. If your antenna system will deliver a good signal for, say, 16 minutes, you would actually want to turn the recorder on at 1332 and then off again at 1348 (−8 minutes and +8 minutes from the nominal overhead time).

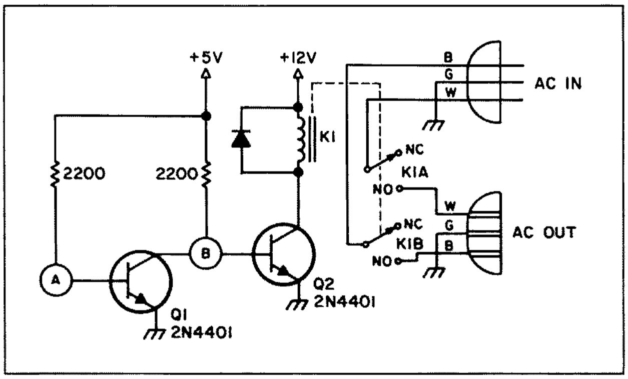

Fig. 1. Ac-switching circuit.

Once you get this far, it should be evident that for *any* descending overhead pass, you would want to turn the recorder on about 32 minutes after the reference crossing time and turn it off again about 48 minutes after crossing. The same range is quite close enough for other satellites in the 100–104-minute range of periods and is entirely satisfactory for the "best pass" on either side of overhead as well.

What about an ascending pass? I'll let you try out the math, but your answer should be about reference +3 minutes for "on" and reference +19 minutes for "off." The precise values for your own station can be calculated based on your actual latitude, but the process is the same.

You can do this simple calculation based on the predict printout for each day or, better still, modify your program to let the computer do it for you. The added "on/off" time routine can involve simply adding the fixed offsets to the reference time or you can have the computer incorporate the same calculations we did manually.

If the computer knows when the recorder should be turned on and off each day, it could actually do the job itself if it also knows the time. One of my Color Computers is equipped with a real-time clock from Speech Systems and it does everything. It computes the orbits and then turns on the recorder using the internal cassette relay (MOTOR ON and MOTOR OFF commands in Color Basic) and the ac-switching circuit shown in Fig. 1.

Many other computers have either software or hardware clocks and can perform the same functions with some added I/O hardware. The circuit in Fig. 1 incorporates switching via a TTL HIGH or LOW signal as well as relay control, depending on the I/O ports available. K1 is a standard 12-V-dc DPDT relay, which is used to switch both sides of the ac line to turn on the tape system.

Basically, the relay is inserted into the hot leads of a standard 3-wire extension cord. The relay and all "hot" ac connections

should be enclosed in either an insulated plastic cabinet or a grounded metal one.

If you want to use your computer cassette relay for control, connect the relay to ground and point A. The pull-up resistor at A normally keeps Q1 ON so that point B is LOW and the relay stays in the normally closed condition. Pulling point A to ground by activating the computer relay (a MOTOR ON command with the Color Computer, for example) will turn Q1 OFF; B will go HIGH and the relay will pull in, activating the load—usually the tape recorder.

The diode across the relay coil can be virtually any silicon type (rectifier, etc.) and is used to suppress the voltage spike that develops when K1 is deactivated. If you would like to switch the system ON with an active TTL LOW, simply connect to point A. If you want to switch ON with a TTL HIGH, leave out Q1 and the resistor to A and connect to point B.

Multiple Events

If you have taken the big jump from having your computer print out on/off times to actually doing the job, you are well on your way to multi-event capability. Since the computer has already done the orbital predictions for a single day, there is no reason why, once recording for a specific day is complete, it can't jump to the next day and repeat the process.

The only limit to the number of passes you can record in this way is the capacity of your tape system. Add some I/O control to switch frequencies and the ability to keep track of more than one spacecraft at a time and suddenly you can be up to your elbows in satellite pictures at the end of a day, let alone a week!

That kind of capability can also be had with even less effort and without dedicating a computer to the task if you desire. Let's go back to the basic single-event timer and see what can be done to get additional pictures.

A single-event timing system can obviously be set to capture a range of pictures if you set it to go on at a time just prior to a sequence of images and off just after the end of a sequence. Although such an approach will produce good results with something like the block of 1800Z prime IR and visible-light images each day from GOES, fully half the tape or more would represent the dead carrier intervals between picture transmissions.

Date	01 June 1987	
Spacecraft	**NOAA-9**	NOAA-10
Orbit Number	12704	3645
Eq. Crossing Time (UTC)	0000.19	0039.27
Longitude Asc. Node (Deg. W.)	132.84	76.32
Nodal Period (Min.)	102.0638	101.2979
Frequency (MHz)	137.62	137.50

These orbital parameters are projected two months in advance due to deadline considerations. Accumulated errors due to uncompensated orbital decay and other anomalies result in expectation of errors up to two minutes and possibly as many degrees in terms of the crossing data and possible small changes in the indicated period. Users requiring precision tracking data should rely on more current sources.

Table 1. TIROS/NOAA orbital predict data.

These tape-wasting "gaps" can be eliminated by adding a tone-detector circuit to the system as shown in Fig. 2. The actual tone detector is a 567 PLL chip used in virtually all touchtone™ decoder circuits and also in timebase circuits.

The vco control is adjusted with a sample of the satellite subcarrier signal at point S. Set the control for the steadiest possible ON indication of the LED indicator—a point somewhere near midrange on the pot. The LOW at pin 8 of the 567 could be used to trigger the control circuit of Fig. 1 directly and thus cause the recorder system to come on whenever a satellite subcarrier was present, but this would present some practical problems.

Momentary interruptions in the subcarrier signals (such as typically occur right after the start tone in the case of WEFAX weather charts), extremes of subcarrier modulation, or temporary losses of signal due to a fade or interference in the case of polar orbit operation would cause unnecessary cycling of the recorder. To eliminate this problem, a 555 is wired as a missing pulse detector with a time delay determined by the value of RT.

For WEFAX, where loss of the subcarrier will be rare and of short duration, a time delay of about 5 seconds will suffice. Polar-orbit operations require a longer delay—about 30 seconds being useful in practice. Values for 5- and 30-second delays are shown in the schematic.

The 555 will trigger the recorder control relay whenever the tone detector line (pin 8) of the 567 goes LOW and will keep the recorder activated as long as the tone detector line does not stay HIGH for *longer* than the delay value established by RT. Simply connect point B of Fig. 2 to point B of Fig. 1 to control the relay circuit with the 555 output. Q1 and

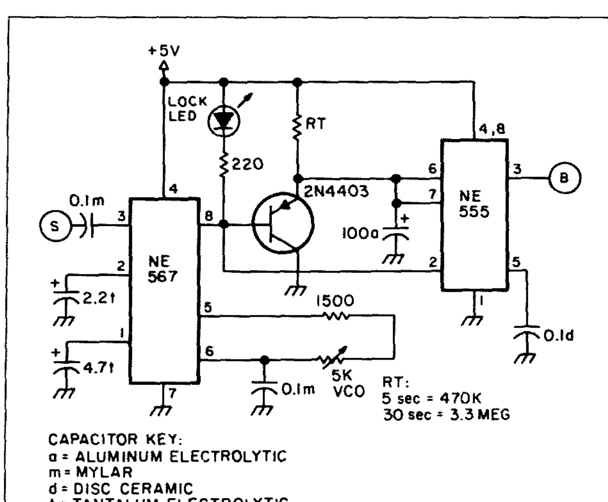

Fig. 2. Tone decoder/delay.

the resistor to point A can be left out of the Fig. 1 circuit for this application.

Loss of subcarrier lock shorter than 5 seconds for WEFAX or 30 seconds for polar orbiters will not cause the recorder to shut down. Your basic digital timer can be used to control power to the tone detector/delay circuit and, if set for a block of WEFAX frames, will enable all frames to be recorded. The only blank tape will be the 5-second delay following the end of each WEFAX transmission!

The use of the relay circuit with polar orbiters is equally flexible. If you have worked at all with tracking programs like the *WSH* PREDICT program, you realize that for any particular spacecraft there is a pair of "best pass windows" representing approximately one hour on either side of the time for a nominal overhead pass.

If NOAA 9 passes overhead at approximately 3 p.m. local time, the best pass "window" will extend from 2 p.m. until 4 p.m. If the digital timer is set to activate the relay circuit, the best pass of the afternoon will be recorded without your having to know exactly when it will occur!

If your receiver is a scanner, simply set it to cycle through all the potentially useful channels and widen the recording "window" to anything you want. Nothing will happen if a channel temporarily locks up with intermod or other interference, but should the system lock on a valid satellite signal, the tone relay circuit will cause it to be recorded. You will get bits and pieces of marginal passes with this approach, but you will also get the prime passes of any spacecraft your system can receive!

You will want to set the squelch control carefully so that it will not trigger too often in the absence of a signal, lest it latch up on an empty channel that happens to have a bit of rf garbage present, nor do you want it to close and start scanning when a signal *is* present. In any case, it is a simple approach that should net you lots of interesting daylight passes while you are away earning the money to pay for all of this!

For those of you with an adventurous spirit, you may want to use a tone decoder system like this to trigger the scanning on your system. With most scanners, the output of a noise amplifier is used to generate a control voltage such

that when the channel has minimal noise (outside of the audio passband), scanning will stop. If there is noise present (indicating an empty channel), the system will scan past that frequency.

There is no reason why the circuit in Fig. 2 cannot be modified to control the scanner based on the presence or absence of a 2,400-Hz tone! In this way, your system will seldom lock on intermod or other interference but will simply keep scanning until a valid satellite signal is present!

Although much of the previous discussion has focused on the operation of a tape-recording system, similar approaches can be used to control your imaging system directly. The *WSH* scan converter, for example, requires a valid 300-Hz start tone when in the automatic WEFAX mode.

If I want to display a particular frame in the daily schedule, I simply have to set up a timer to control the audio input to the system so that a signal is routed to the scan converter just prior to the frame of interest. The timer can then be used to break the audio connection when the frame is complete. The scan converter will hold the image until the input connection is either manually or automatically restored. A similar approach can be used for a FAX recorder that has provisions for automatic printing.

Photo A. An example of full disk IR imagery using the FAX circuit from the second edition of the WSH.

Picture of the Month

This month's image comes from a real live reader—in this case, Mr. Doyle Hauschulz NØAB of Sapello, New Mexico. Doyle has access to GOES TAP, a service where GOES products are distributed over high-grade landlines using 120-lpm FAX, and he printed this example of full disk IR imagery using the FAX circuit from the second edition of the *WSH* (essentially the same project is also in the current third edition).

My choice this month was based on three factors. First, Doyle did an excellent job in constructing the FAX recorder as evidenced by the quality of the reproduction. Secondly, most of us rarely get to see any of the formats used by GOES TAP, so take a gander at some full disk imagery! Finally, the image is educational, quite aside from the weather.

Note that the earth disc is stretched vertically. Doyle's drum is a bit too narrow to yield the correct aspect ratio with this service, so each line is a bit short, yielding the "stretched" appearance in the vertical axis.

This could be corrected by slowing the carriage drive motor or changing the threaded drive, but this would degrade vertical resolution due to overlapping lines unless a smaller stylus wire were used. The alternative is to use a drum with a larger diameter. That is the simplest alternative and the next item on Doyle's agenda!

As I noted with the opening column, I welcome such reader submissions, but I haven't been getting much from you folks. The pictures don't have to be perfect—just pretty or interesting. If they are both, I am almost certain to use them! I can't promise to use everything that I get, but it is certain I will never use what I don't get!

Note

References to the *WSH* refer to the third edition of the *Weather Satellite Handbook*, available from yours truly for $12.50 plus $1 shipping and handling in the U.S. and $2 elsewhere. ■

HAMSATS

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SOURCES OF INFORMATION

"Where can I find more information on the amateur satellite program?" In all the letters and phone calls I've received since starting this column in January, that question has been asked more times than any other.

Where *can* you find more information? In previous columns, I have mentioned *The Satellite Experimenter's Handbook* by Martin Davidoff K2UBC and the AMSAT nets on 75 and 20 meters. (See Table 1 for a current listing of AMSAT nets.) Now I'll tell you about various organizations, magazines, books, and computer bulletin board services, both on the air and via twisted pair, where you can find more in-depth information.

Organizations

AMSAT NA, the Radio Amateur Satellite Corporation of North America, is your best all-around organization for information on the satellite program. Membership is $24 per year here in the States and $26 overseas. You can write to AMSAT NA at PO Box 27, Washington DC 20044, or call (301)-589-6062 during business hours. Payment via MasterCard, VISA, or personal check is accepted. For those outside the U.S., drafts must be in American dollars drawn on a U.S. bank.

New members will receive the *Beginner's Guide*, a rather thick publication filled with data and information on setting up your station and how to find and communicate through the satellites. You will also receive a handout on Fuji-OSCAR 12, the latest trinket catalog, and a computer software availability listing from the AMSAT Software Exchange.

Members also receive the *Amateur Satellite Report* every two weeks. This newsletter incorporates material from the AMSAT nets, orbital predictions from NASA, and feature articles covering many topics of interest to both the newcomer and old hand alike. Overseas members can receive *ASR* via airmail if desired. Contact AMSAT NA for details.

While several membership services are available to anyone, members receive discounts on satellite-tracking software, can participate in achievement programs and receive AMSAT award certificates, and know that their membership fees help pay for new satellites.

Another stateside organization supporting the amateur satellite program is Project OSCAR of Los Altos, California. They publish the *JAS-1 Satellite Handbook* and the *Amateur Satellite Orbital Predictions* book. The first book is about 50 pages long and full of information on the Japanese hamsat program along with technical specifications on FO-12.

The orbital predictions book contains equator crossing data for UoSAT-OSCAR 9, UoSAT-OSCAR 11, Fuji-OSCAR 12, RS5, and RS7 for all of 1987. This data is quite useful if you are using manual satellite-tracking systems like the Oscarlocator package from the ARRL or the Satellipse from ZRO Technical Devices. Some of the older computer tracking programs also require this type of input.

The publications are $10 each from Project OSCAR, PO Box 1136, Los Altos CA 94023. They also carry a few software items by James Miller G3RUH that have been adapted for Commodore, Radio Shack, and IBM-PC computers.

Several organizations supporting the development of space satellites for amateur radio communication exist overseas. To simplify matters, I will not discuss those with publications written in languages other than English, though organizations like AMSAT-DL of West Germany provide much of the insight, funding, and drive behind hamsat activities.

A very prominent organization is AMSAT-UK. They are affiliated with the Radio Society of Great Britain and publish *OSCAR NEWS* bimonthly. It is the official journal of AMSAT-UK for all who use OSCAR satellites. To join AMSAT-UK, request a current application form from the Honorary Secretary, Ron J. C. Broadbent G3AAJ, 94 Herongate Road, Wanstead Park, London E12 5EQW, England.

A minimum donation of £17.50 (about $29) is requested of overseas members. Getting a draft payable in foreign currency is usually quite easy from any major U.S. bank. Payments can also be accomplished by direct bank transfer. Ron can provide the details.

Net Description	Day	Time	Freq	Notes
International				
AMSAT International	Sunday	1900 UTC	14.282 MHZ	
AMSAT International	Sunday	1800 UTC	21.280	1
AMSAT South Pacific	Saturday	2200 UTC	14.282	2
National				
AMSAT UK	Sunday	1015 local	3.780	
AMSAT UK	Mon & Wed	1900 local	3.780	
SA AMSAT	Sunday	0900 UTC	14.280	
SA AMSAT	Sunday	0900 UTC	7.080	
AMSAT VK	Sunday	1000 UTC	3.685	3
Regional				
AMSAT NA East Coast 75 M	Wednesday	2000 EDT	3.840	
AMSAT NA Mid-America 75 M	Wednesday	2100 CDT	3.840	
AMSAT NA West Coast 75 M	Wednesday	2000 PDT	3.840	
Local				
USA				
Los Angeles 2 M	Wednesday	2000 local	144.144	
Los Angeles 2 M	Daily	0730 local	144.144	
AMSAT South Pacific/LA	Sunday	2200 UTC	144.144	4
Cent Cal OSCAR AMSAT Net	Tuesday	2000 local	147.150	5
East Coast 75 M/NYC	Tuesday	2000 local	144.280	6
Colorado AMSAT Net	Wednesday	0300 UTC	147.225	
Houston Area AMSAT Net	Tuesday	2200 local	145.450	7
Chicago Area AMSAT Net	Wednesday	1930 local	148.880	8
Miami Area AMSAT Net	Tuesday	2000 local	146.925	9
South Africa				
SA AMSAT	Sunday	0900 UTC	145.650	
UK				
England: Brighton Area	Sunday	1915 local	144.280	
Scotland: Paisley	Daily	0900 local	144.625	

Notes:
1. Net inactive. Reactivation when conditions improve.
2. This net may return to 21.280 MHZ as conditions dictate.
3. Back-up frequency is 7.064 MHZ.
4. Links to 443.525 MHZ, 146.655 MHZ and 223.720 MHZ.
5. Two-meter simulcast of HF net by W6SP.
6. Two-meter simulcast of HF net by WA2LQQ.
7. Back-up frequency is 146.700 MHZ.
8. PL 1B required for access.
9. Rebroadcast of East Coast 75 M net.

Table 1. AMSAT information services worldwide—voice nets.

AMSAT-UK has many items, computer programs, books, and circuit boards for various projects available to members. Prices on these items are 25 percent lower for members than for non-members.

From Down Under, AMSAT-Australia provides its members with a very informative newsletter, written by National AMSAT coordinator Graham Ratliff VK5AGR. Graham is also one of the ground control stations for AMSAT-OSCAR 10. Regular contributors to their publication include James G3RUH and Ian Ashley ZL1AOX, another prominent AO-10 ground-control station.

Subscription rates for us here in the States are $30 Australian (about $21.80) per year. Address all correspondence to AMSAT-Australia, GPO Box 1234, Adelaide 5001, Australia. One stateside ham who subscribes to *all* the overseas satellite-oriented publications places AMSAT-Australia at the top of his list.

One last organization that publishes an English newsletter is Southern Africa AMSAT. They have been instrumental in the development of some of the spacecraft antenna systems for Phase 3C. They have recently agreed to work on antenna designs for Housat 1, the first packet satellite under development in Houston, Texas, by the Packet Technology Satellite Experiment group.

Membership in SA AMSAT is 50 rands (about $25) per year for overseas members. Their address is SA AMSAT, PO Box 13273, Northmead 1511, Republic of South Africa. All exchange rates are approximate and subject to change.

Magazines

Obviously *73* gets top billing in this category. Satellite interest runs high among the editors and management of the magazine. I am hoping for an issue dedicated solely to the satellite program in the future. No further details are needed concerning *73* and the satellite program. Just keep on subscribing!

From the ARRL, we have four periodicals of interest to satellite fans. *QST* provides the column "Amateur Satellite Communications" by AMSAT NA President Vern "Rip" Riportella WA2LQQ.

The 1987 ARRL *Handbook* devotes an entire chapter to the amateur satellite program. This material is an improvement over

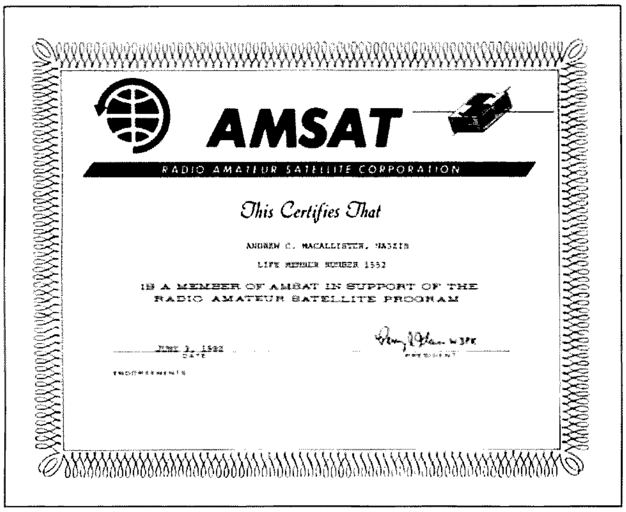

Fig. 1. AMSAT NA member certificate.

Fig. 2. AMSAT-UK member certificate.

the 1986 information. Much of the content is recent and includes pictures of some rigs that work well for satellite operation.

The ARRL also publishes *OEX*, which incorporates the ARRL Experimenters' Exchange and *AMSAT Satellite Journal*. Although the articles are rather technical, the material is thought-provoking and, at $8 per year for AMSAT or ARRL members, is not expensive.

The *ARRL Letter* is a biweekly publication that occasionally covers important hamsat news and events. It is available to ARRL members for $19.50 per year.

The Radio Society of Great Britain has a satellite column by Bob Phillips G4IQQ in its general-interest ham magazine, *Radio Communications*. Membership in the RSGB is $23 per year through the ARRL.

Another British publication with a lively satellite column is *Practical Wireless*. Pat Gowen G3IOR provides data on all facets of amateur satellite communications in his column. He also writes occasional feature articles to augment the column. Pat is a former Director of AMSAT NA and is active on every communications-type hamsat. Subscription rates are £15 (about $24) payable by bank draft to Practical Wireless. Mail to The Subscription Dept., Farndon Road, Market Harborough, Leics, England.

Other foreign magazines with regular amateur satellite contributors include *Amateur Radio* from the Wireless Institute of Australia, with VK5HI supplying the satellite information, and *Break-In* from New Zealand. Irving ZL1MO provides the input for them.

Virtually all ham radio magazines have carried articles on the amateur satellite program at one time or another. For those that do not support a regular column, it is easier and less expensive to check for good articles in library copies rather than trying to buy everything that hits the street.

Books

In addition to *Satellite Experimenter's Handbook*, published by the ARRL and available from AMSAT NA for $10, consider *The AMSAT-Phase III Satellite Operations Manual*. It was prepared by AMSAT NA and published by Project OSCAR. This document is loaded with figures, tables, tracking information, and even some computer program listings for Radio Shack and IBM-PC computers. As a "cookbook," it is a useful tool for the serious satellite enthusiast as well as for the newcomer. AMSAT NA has this volume for $15.

Two older books worth looking for include *OSCAR: The Ham Radio Satellites* by Dave Ingram K4TWJ and *OSCAR Amateur Radio Satellites* by Stratis Caramanolis. Although these two books were published before 1980, they provide excellent information on orbital mechanics and the basics of satellite communications for hams.

BBSs

Computer bulletin board systems provide AMSAT groups with a fast and accurate medium for information exchange. Dr. Bob Diersing N5AHD performed the duties of system operator on his hamsat-oriented system for some years. Today AMSAT Vice-President of Operations Ralph Wallio WØRPK keeps the information up-to-date from Iowa with an open BBS at (515)-961-3325. Its purpose is to inform AMSAT members of the latest news items concerning the amateur satellite program.

Another CBBS in Texas is run by Jeff N5ITU at (214)-340-5850. AMSAT NA is currently compiling a list of packet radio bulletin boards that regularly carry AMSAT News Service bulletins. Watch this column for the listing when it is completed.

The amateur radio satellite program is not a secret. The information is out there waiting for you. Pick up a few books and publications for those moments when the bands are quiet and watch this space in the months to come! ■

BARTER 'N' BUY

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 80-page catalog, $5. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90815. BNB045

MARINE RADIO: Marconi Canada CH-125 synthesized AM/SSB transceiver, 22 channels on 4, 8, and 12 MHz, 125 Watts, 12 V dc. Never used, list $1,995, asking $1,495. Stu Norwood, 70 Rte. 202 North, Peterborough NH 03458. BNB047

QSLs to order. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

THE DX'ERS MAGAZINE. Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DXCC Honor Roll Certificate 2-4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

RADIO TRANSCRIPTION DISCS WANTED. Any size, speed. W7FIZ—WG, Box 724, Redmond WA 98073-0724. BNB347

XEROX MEMORYWRITER—parts, assemblies, boards, manuals. Free help with service problems. W6NTH, Box 250, Benton AR 72015; (501)-776-0920. BNB404

HAM TRADER YELLOW SHEETS, in our 24th year. Buy, swap, sell ham-radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. $12 for one year (24 issues). PO Box 2057, Glen Ellyn IL 60138-2057. BNB412

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YAESU OWNERS—Hundreds of modifications and improvements for your rig. Select the best from 14 years of genuine top-rated Fox-Tango Newsletters by using our new 32-page Cumulative Index. Only $5 postpaid (cash or check) with $4 rebate certificate creditable toward newsletter purchases. Includes famous Fox-Tango Filter and Accessories Lists. Milt Lowens N4ML (Editor), Box 15944, W. Palm Beach FL 33416; (305)-683-9587. BNB448

TOWER CLIMBING SAFETY BELTS and accessories. Free specs. Avatar Magnets W9JVF, 1147 N. Emerson #7, Indianapolis IN 46219-2929. BNB458

FIND OUT what else you can hear on your general-coverage transceiver or receiver. Join a shortwave radio listening club. Complete information on major North American clubs and sample newsletter $1. Association of North American Radio Clubs, PO Box 462, Northfield MN 55057. BNB464

WANTED: Old Western Electric, RCA, Telefunken, Mcintosh, Marantz, Dynaco, Tannoy, Altec—tubes, amplifiers, speakers. Maury Corb, 11122 Atwell, Houston TX 77096; (713)-728-4343. BNB479

LEARN CODE on your IBM PC (or compatible), Commodore C-64/128, or Macintosh. CODE-PRO takes you from no knowledge to proficient copy. Specify computer. $10 plus $2 s&h. Trio Technology, Dept. 861, PO Box 402, Palm Bay FL 32906. BNB490

SIGNAL GENERATORS: HP606A, 50 kHz through 65 MHz $375; HP608C, 10 MHz through 480 MHz $345; TS-510A/U, 10 MHz through 420 MHz, military version of HP608D $295; URM-25D, 10 kHz through 50 MHz $245; URM-26A, 4 MHz through 405 MHz $245; HP616B, 1.8 GHz through 4.2 GHz $375; HP618B, 3.8 GHz through 7.6 GHz $375; SG-13/U aircraft VOR/ILS, range 108 MHz through 135.9 MHz and 329.9 MHz through 335 MHz, operates from 28 V dc at 3-1/2 Amps bench power supply or aircraft battery, ideal for aircraft radio repair $285. All lab calibrated, satisfaction guaranteed, have quantity. VISA, M/C, or check. Add shipping. Phone Bill Slep (704)-524-7519, Slep Electronics Company, Highway 441, Otto NC 28763. BNB494

Barter 'N' Buy advertising must pertain to ham radio products or services.

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Prepayment required. *Count only the words in the text. Your address is free. 73* cannot verify advertising claims and cannot be held responsible for claims made by the advertiser. Liability will be limited to making any necessary corrections in the next available issue. Please print clearly or type (double-spaced).

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POST CARD QSL KIT—Converts post cards, photos to QSLs! Stamp brings circular. K-K Labels, PO Box 412, Troy NY 12181-0412. BNB498

CODE PROGRAMS. APPLE/C-64. 37 modes, graphics, menus, wrdprcsr, etc. Write: LARESCO, POB 2018, 1200 Ring Road, Calumet City IL 60409; (312)-891-3279. BNB507

HOME-BREW PROJECTS LIST. SASE WB2EUF, PO Box 708, East Hampton NY 11937. BNB509

VIDEOCIPHER DESCRAMBLING MANUAL—115 pp.—$27.45 ppd. Oak Orion—77 pp.—$22.45 ppd. Satellite catalog $2. Microtronics, PO Box 2517-L, Covina CA 91722. BNB513

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $10. Amazing mnemonics: Learn Morse code in 1 hour; Q signals supereasy; Novice written exam supereasy! $5 each. Money-back guarantee. Bahr, Dept. 73-2, 2549 Temple, Palm Bay FL 32905. BNB517

DX AWARDS. Need info on any DX awards, especially lesser known ones. Check incoming cards for stickers or award notices. Directory planned for mid-1987. Ted Melinosky K2BV, 525 Foster Street, South Windsor CT 06074-2936. BNB526

COMMODORE CUSTOM/PROPRIETARY CHIPS for the Commodore 64/128 etc., etc. Low prices: 6526/6510—$9.95, 6581—$12.85, 6567—$14.75, 82S100/PLA—$12.85, 8701—$7.25, and many, many others. Ask about *user group/quantity pricing*...Just released from Australia, "The Commodore Diagnostician," a laminated chart for diagnosing faulty ICs, $6.95 p.p.... HD Power Supply for the C-64 $29.95...Want us to fix your computer? We will send Federal Express the same day you call, pay for return postage, fix your computer within 72 hours for a low flat rate of $59.95...Call toll free (800)-642-7634 (outside NY) or (914)-356-3131; Kasara Microsystems, Inc., 33 Murray Hill Drive, Spring Valley NY 10977. BNB529

QSLs, QSLs, RUSPRINT QSLs. Quantities of 100, 200, 300, or more. Full color Old Glory and cartoon. Also Parchment, Golden Eagle, and others. SASE appreciated. Rusprint, Rte. 1, Box 363-73, Spring Hill KS 66083. BNB532

YOUR TICKET OR UPGRADE via computer. Complete Novice course—theory, code, QSOs, more. Complete code course—Novice, General, Extra. For IBM, Radio Shack, Commodore. Also great for examiners. SASE for details: JERLS, Incorporated, PO Box 1193S, Bedford VA 24523. BNB541

SAVE $1.50 SHIPPING on 87-88 ARRL *Repeater Directory*. Send $5 total. All ARRL titles available for book price plus $1 shipping. Marshall Hill Enterprises, Inc., Marshall Hill, Bradford NH 03221. BNB548

FACTORY FRESH NICds. Rebuild your old packs. AA/$1.45 each. AAA/$1.45 each. 2N 270AA w/tabs (replaces 2N 250AA in ICOM 2AT/4AT BP3 packs) $1.85 each. Pack of 7 2N 270AA wired for your BP3 case $14.95 each. 2N 450A w/tabs (used in ICOM BP2/BP5, Tempo S4, Yaesu FT-207R/208R) $2.40 each. Sub C w/tabs $2.60 each. Add $2 S&H/order. Cunard Associates, R.D. 6, Box 104, Bedford PA 15522. BNB557

HAM RADIO REPAIR, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128; (408)-729-8200. BNB558

NEW, UNIQUE LOGGING AND CONTEST PROGRAMS for the Commodore C-128. Fast, generalized sort and print. SASE for description; $24.95 for the package. Dave Kirk KY3J, 1914 Yardley Road, Yardley PA 19067. BNB559

NJ—NJ—NJ—NJ—NJ—NJ—NJ—NJ—FINALLY!! A ham—SWL—CB—scanner store in N.J. Discount grand opening prices. Top performing radio systems for every budget. New 10-meter and VHF/UHF rigs. Antenna Specialists, ARRL, Astatic, Azden, B&W, Belden, Bilal, Butternut, Clear Channel, Daiwa, Diamond, Kenpro, Kenwood, KLM, Larsen, Mirage, Nye, Santec, Sanyo, THL, Yaesu, Welz, much more. Open M—F 10 a.m.-9 p.m., Sat. 10 a.m.-7 p.m. Have qualified repair facility. Abaris Systems, 276 Oriental Pl., Lyndhurst NJ 07071; (201)-939-0015. BNB560

HEATH 10-MHZ SCOPE, all xistor, fact. assembled, IO-4530, $150; Motorola TU-576 rf generator for two-way FM, $100; Heath IG-57 TV sweep/marker gen. w/all cables, manual, etc. All transistor, xtal markers, $100; Motorola Motrac U41LHT-3400A w/extender, all cables, mike, head, etc. on 49 MHz, $50; Regency synthesized scanner, K-500, 40-ch. memory, like new, $125; aircraft scanner, $20; Ramsey D-1200 VOM, new in box, $15. All working in exc. cond. Add UPS. SASE for info. T. E. McLaughlin, PO Box 411, Mango FL 34262; (813)-681-9709 eve. only. BNB563

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THE DX BULLETIN provides you with comprehensive, up-to-date DX information and much more. SASE or call for samples. Box 4233W, Santa Rosa CA 95402; (707)-523-1001. BNB565

1987 "**BLOSSOMLAND BLAST**" Sunday, September 20, 1987. Write "Blast," PO Box 175, St. Joseph MI 49085. BNB569

WANTED: Equipment and related items. The Radio Club of Junior High School 22 NYC, Inc., is a nonprofit organization, granted 501(c)(3) status by the IRS, incorporated under the laws of the state of New York with the goal of using the theme of ham radio to further and enhance the education of *young people. Your property donation* would be greatly appreciated and acknowledged with a receipt for your tax-deductible donation. Please con-

SPECIAL EVENTS

SEAWALL FESTIVAL
JUN 5–7

The Portsmouth ARC will operate W4POX from the *Lightship Portsmouth* at the Portsmouth Seawall Festival on June 5–7, from 1500–0200 UTC. Frequencies will be around 3.890, 7.230, and 14.290. For a special commemorative QSL, send your card and an SASE to W4POX, 2800 Greenwood Road, Chesapeake VA 23321. For a QSL and a large commemorative certificate, send your card and a 9" x 12" envelope with two units of first-class postage.

KITCHENER ONT
JUN 6

The Guelph and Kitchener-Waterloo ARCs will sponsor the 13th annual Central Ontario Amateur Radio Flea Market on June 6, from 8 a.m. to 2 p.m., at Bingeman Park, 1380 Victoria Street North, Kitchener, Ontario. General admission $3. Children 12 and under free. Tables $5 per 8-foot space. No outside vendors. For further information, call Ray Jennings VE3CZE at (519)-822-8342, Paul Modray VE3CHM at (519)-579-3057, or Eric Enns VE3BB at (519)-885-5216, or write to Guelph ARC, PO Box 1305, Guleph Ontario N1H 6N9 Canada or to Kitchener-Waterloo ARC, PO Box 812, Kitchener Ontario N2J 4C2 Canada.

PITTSBURG KS
JUN 6

The Pittsburg Repeater Organization, Inc., will hold its 1987 hamfest on June 6, from 10 a.m. to 5 p.m., in the Lincoln Park Pavilion, in Pittsburg, Kansas. Admission $5 for the first adult and $1 for each immediate family member over age 15. Free tables. Examinations 8–10 a.m. Talk-in on 146.34/.94. For further information, contact Ken Johnston KCØVZ, PO Box 1303, Pittsburg KS 66762.

GRAND RAPIDS MI
JUN 6

The Independent Repeater Association will sponsor its annual Hamfest on June 6, from 8 a.m. to 4 p.m., at the National Guard Armory, 44th Street, one half mile west of U.S. 131. Free tables for dealers and sellers. Talk-in on 147.165/.765. For table reservations, contact Independent Repeater Association, 562 92nd Street S.E., Bryon Center MI 49315; (616)-455-3915.

WENATCHEE WA
JUN 6–7

The Apple City Radio Club will hold a "Come Have a Picnic With Us Hamfest" on June 6 and 7 at Rocky Beach Dam, 7 miles north of Wenatchee on U.S. Highway 97. License exams given. For further information, contact Apple City RC, 1002 No. Surry Road, Wenatchee WA 98801.

OHIO WINE MONTH
JUN 6–7

The Wireless Institute of Northern Ohio (WINO), an organization sponsored by the Lake County ARA, will be on the air with a special-event station on June 6 and 7 to commemorate Ohio Wine Month. On Saturday evening, operation will be between 7 and 11 p.m. EDT (2300 to 0300 UTC) on 3.860 and 7.235. On Sunday, operation will be between 11 a.m. and 3 p.m. EDT (1500 to 1900 UTC) on 7.235 and 14.235. The station will be located at a winery in Madison, Ohio, and will use the call KO8O. A special 8-1/2 by 11 QSL certificate will be available from KO8O—WINO Weekend, 7126 Andover Drive, Mentor OH 44060. Send a legal-sized SASE.

ST. PAUL MN
JUN 6–7

The North Area Repeater Association will sponsor the upper midwest's largest swapfest and exposition for amateur radio operators on June 6 and 7 at the Minnesota State Fairgrounds in St. Paul, Minnesota. Call wide area repeaters .25/.85 or .16/.76 for directions. Admission $4 in advance, $5 at the fair. Amateur license exams will be given. For more information, dealer inquiries, or ticket order, contact Amateur Fair, PO Box 857, Hopkins MN 55343; (612)-566-4000.

BSA CAMP-O-RAMA
JUN 6–7

The Los Angeles Area Council of the Boy Scouts of America will host a Council-wide Camp-O-Rama on the campus of the California State University at Dominguez Hills on June 6–7. Commemorative station N6BSA will be manned by amateur radio clubs of the Los Angeles Council of Amateur Radio Clubs. Hours of operation will be from 1500 UTC on June 6 through 0200 UTC on June 7. Operation: HF phone—3.915, 7.255, 14.255, 21.350, 28.450; VHF phone—145.690, 223.500, 146.235/.835, 224.600; VHF packet—145.090, 146.745/.145. Special QSL cards will be available. QSL with an SASE to N6BSA, Boy Scout Camp-O-Rama, PO Box 5082, Torrance CA 90503; DO NOT use the *Callbook* address.

LOVELAND CO
JUN 6–7

The Northern Colorado ARC will present its 9th annual Superfest on June 6 and 7, at the Larimer County Fairgrounds in Loveland, Colorado. The event will be located in the McMillen Building, which is wheelchair-accessible. General admission is $3. Tables are $7.50 each in advance, $9 at the door, and include two chairs and an admission. License exams given. For hamfest reservations, contact Duff McRoberts NFØU, 1308 Ellen Place, Loveland CO 80537; (303)-669-3708.

PITTSBURGH PA
JUN 7

The 33rd annual Breeze Shooters Hamfest will be held on June 7, from 9 a.m. to 4 p.m., at the White Swan Amusement Park, PA Rte. 60 (Parkway West), near the Greater Pittsburgh International Airport. Free admission and flea market. 10-meter check-in on 29.000, 2-meter check-in on 146.52. Directions on 146.28/.88. Registration $2 each, 3 for $5, and 7 for $10. For further information and table reservations, please contact Bud Faulhaber N3DOS, 1059 Balmoral Drive, Pittsburgh PA 15237; (412)-366-5097.

AKRON OH
JUN 7

The 20th annual Goodyear Hamfest will be held on June 7, from 10 a.m. until 5 p.m., at Wingfoot Lake Park near Akron, Ohio. Family admission is $3 in advance and $4 at the gate. The outside flea market will be $2 per vehicle. A sheltered inside dealer area will be available at $5 per table (advance reservations suggested). Talk-in on 146.04/.64 until 1:30 p.m. For tickets and information, contact Don W. Rodgers WA8SXJ, 161 Hawkins Avenue, Akron OH 44313; (216)-864-3665.

MANASSAS VA
JUN 7

The Ole Virginia Hams will present the annual Manassas Hamfest on June 7, from 8 a.m. until 4 p.m., at the Prince William County Fairgrounds. General admission $4, children under 12 admitted free. Tailgating $5 per space in addition to general admission. Talk-in on 146.37/.97, 146.52. For exhibit space, call Joe Schatter K4FPT at (703)-368-8599 or Bob Zaepfel K4HJF at (703)-368-3763. For more information, write to Ole Virginia Hams ARC, PO Box 1255, Manassas VA 22110, or call John Gunsett KI4VP at (703)-361-5255 or Gene Roberts N4HFW at (703)-361-3983.

CHELSEA MI
JUN 7

The Chelsea Communication Club will sponsor the 10th annual Chelsea Swap 'N' Shop on June 7, from 8 a.m. until 1 p.m., at the Chelsea Fairgrounds in Chelsea, Michigan. Donation: $2.50 in advance, $3 at the gate. Table space: $8 per 8 feet. Trunk sale: $2 per space. Special handicap parking. Talk-in on 146.980. For more information, contact Robert Schantz, 416 Wilkinson Street, Chelsea MI 48118; (313)-475-1795.

HUMBOLDT TN
JUN 7

The Humboldt ARC will sponsor its annual hamfest on June 7, from 8 a.m. to 4 p.m., at Bailey Park, 22nd Avenue, Humboldt, Tennessee. Admission $1. Talk-in on .37/.97. For further information, contact Ed Holmes W4IGW, 501 N. 18th Avenue, Humboldt TN 38343; (901)-784-3490.

ERLANGER KY
JUN 7

The Northern Kentucky ARC announces "Ham-O-Rama '87" to be held on June 7, beginning at 8 a.m., at the Erlanger, Kentucky, Lions Park. Directions: I-75 to Exit 184B (Rte. 236 East). Go two miles to Dixie Highway (State Rtes. 25 and 42). Go south one mile to Sunset Avenue. Turn right on Sunset to end of street. Admission is $5, with children under 13 free. Extensive outside flea market area. Flea market spaces are $3 each (tables not provided). Major vendor space indoors is $10, with tables provided. Talk-in on 147.855/.255 or 147.975/.375. Contact WA4WNF, c/o NKARC, PO Box 281, Florence KY 41042; (606)-371-2255 for further information.

WASHINGTON DC
JUN 10–13

The Antique Radio Club of America (ARCA) will hold its 15th annual National Convention on June 10–13 at the Sheraton Hotel and Exhibition Center on Rte. 450 in New Carrollton, Maryland, 10 miles northeast of Washington, DC, off Exit 20B of the I-495 Capital Beltway. Organizers of this year's ARCA Convention are the Mid-Atlantic Antique Radio Club officers in Laurel, Maryland.

CUMBERLAND 200TH
JUN 12–14

The Mountain ARC will operate station W3YMW at the Western Maryland Railway station on June 12–14 as part of the annual Heritage Days Festival of Cumberland, Maryland, in celebration of the city's 200th anniversary. Operation will be in the lower end of the 75-, 40-, 20-, 15-, and 10-meter General phone bands. For a special steam train certificate, send QSL and SASE to Mountain ARC, PO Box 234, Cumberland MD 21502.

BROOKFIELD ZOO
JUN 13

The Chicago Suburban RA will operate its fourth annual special-event station, N9BAT, from the Brookfield Zoo in Brookfield, Illinois, on June 13, from 1500–2300 UTC, as part of the West Suburban Council BSA annual Scout-O-Rama. SSB—7.250 and 14.250. A 2-meter FM station will be operated on 146.55. CW operation is planned on the hour on 14.050 and on the half hour on 7.120. A special, full-color QSL card will be available from the Brookfield Zoo for a OSL and #10 business-sized SASE to N9BAT, Special Event, PO Box 88, Lyons IL 60534.

COEUR D'ALENE ID
JUN 13

The Kootenai ARS will present the N.W. 1st Fly-in Hamfest '87 on June 13, from 7 a.m. to 4 p.m., in the Avionics Building at the Coeur d'Alene, Idaho, Airport. Free admission. Table reservations by June 5 at no charge; walk-ins $5. Novice exams at 11 a.m. Talk-in on 146.38/.98 or 146.52. For table reservations, write to KARS, PO Box 5222, Coeur d'Alene ID 83814.

PARK RIDGE NJ
JUN 13

The Gilfer SWL Fest/Flea Market will be held on June 13 rain or shine. Shortwave only. Free admission to all visitors. Sellers: $3 (tailgating only, bring your own table). Reservation deadline: June 1. Location: Gilfer Shortwave, 52 Park Avenue, Park Ridge NJ 07656. For further information, please call (201)-391-7887.

GRANITE CITY IL
JUN 14

The Egyptian RC's "Egyptianfest" will be held on June 14 at the Egyptian Radio Club's Clubhouse and grounds. Tickets: $1 in advance, $2 each or three for $5 at the hamfest. Flea market space available on a first-come basis. $2 for a 10' wide space. VE testing from 10 a.m to 2 p.m.; walk-ins accepted. Talk-in on 146.16/.76 and .52. For advance tickets, write to Egyptian Radio Club, PO Box 562, Granite City IL 62040.

WILLOW SPRINGS IL
JUN 14

The Six Meter Club of Chicago, Inc., will hold its 30th annual Hamfest on June 14, beginning at 6 a.m., at Santa Fe Park, 91st and Wolf Road, Willow Springs, Illinois (southwest of downtown Chicago). Advance registration $3, $4 at the gate. Write to Mike Corbett K9ENZ, 606 South Fenton Avenue, Romeoville IL 60441 for advance tickets. Talk-in on 146.52 or .37/.97.

QUEENS NY
JUN 14

The Hall of Science ARC Hamfest will be held on June 14, from 9 a.m. to 3 p.m., at the New York Hall of Science parking lot in Flushing Meadow Park, 47-01-111 Street, Queens, New York. Donation: buyers $4, sellers $6 per space. Talk-in on 144.300, 223.600, and 445.225. For further information, call at night Steve Greenbaum WB2KDG at (718)-898-5599 or Arnie Schiffman WB2YXB at (718)-343-0172.

MONROE MI
JUN 14

The Monroe County Radio Communications Association Swap and Shop will be held on June 14, from 8 a.m. to 3 p.m., in Monroe, Michigan. Advanced sale tickets: $2.50, $3 at the gate. Trunk sales, $2 per space. Table space, 50¢ per foot. For tickets or space reservations, contact Elaine Wessel KA8RNK, PO Box 237, Monroe MI 48161; (313)-279-1571.

TERRE HAUTE IN
JUN 14

The 41st annual Wabash Valley ARA Hamfest will be held on June 14, beginning at 8 a.m., at the Vigo County Fairgrounds, in Terre Haute, Indiana, located on U.S. 41, 1/2 mile south of I-70. Advance tickets $2 or three for $5, or $3 at the gate. Children under 12 free. Free outdoor flea market; covered flea market, $3 for 12 x 12 space, some with ac; tables available on first-come basis. FCC exams at the Red Cross Building in Terre Haute; pre-registration only. Talk-in on 147.69/.09 or 146.52. For tickets and more information, send an SASE to WVARA Hamfest, PO Box 81, Terre Haute IN 47808.

OUNELLEN NJ
JUN 20

The Raritan Valley RC will hold its 16th annual hamfest on June 20, beginning at 8 a.m., at Columbia Park, in Dunellen, New Jersey. Sellers' spots are $5 for one space or $10 for multiple spaces; no tables supplied. Lookers pay $3 donation; spouse and children free. Talk-in on 146.025/.625 or 146.52. Advance tickets may be purchased from any club member. For further information, contact any club member or call Dave KA2TSM at (201)-763-4849 or Bill KD2XK at (201)-467-7342 (8 a.m. to 5 p.m.).

GRAND JUNCTION CO
JUN 20

The Grand Mesa Repeater Society will hold the eighth annual Western Slope Amateur Radio and Computer Swapfest on June 20, from 9 a.m. to 4 p.m., at the National Guard Armory, 482-28 Road, Grand Junction, Colorado. Admission is free and swap tables are $5 each. Amateur radio exams given. Talk-in on 146.22/.82 and 449.20. To reserve a swap table and for further information, send an SASE to Les Scott NV0F, 2105 Yellowstone Road, Grand Junction CO 81503 or call (303)-242-5296.

MANCHESTER NH
JUN 20

Fly in to New Hampshire's second largest amateur radio/electronics flea market to be held at the Manchester Municipal Airport on June 20, sponsored by the New Hampshire FM Association. Rain date: June 21. Starting time is 9 a.m. General admission is $1 per person; sellers, $5. Sellers should bring table or tailgate. Talk-in on 146.52. For further information about the flea market, contact Steve Morin WB1BXB at (603)-663-4019 or Dick Desrosiers W1KGZ, 173 Maplehurst Avenue, Manchester NH 03103; (603)-668-6868. All classes of amateur radio exams will be held at the main building of the airport—Ammon Terminal. Walk-ins accepted, but pre-registration is urged. Send Form 610 and check for $4.35 payable to ARRL/VEC to Tom AC1J, Pulpit Road, Bedford NH 03102.

BIG BRUTUS
JUN 20–21

The Wichita ARC will operate W0SOE on June 20 and 21 at the site of Big Brutus, the second largest coal shovel in the world, in Cherokee County, Kansas. Suggested frequencies: 3.875, 7.250, 14.250, and 21.325. Send QSL and SASE via Wichita ARC W0 SOE, 707 N. Main, Wichita KS 67203.

FREDERICK MD
JUN 21

The Frederick ARC will hold its 10th annual Hamfest on June 21, from 8 a.m. to 4 p.m., at the Frederick Fairgrounds. Admission $3, tailgaters $2 extra. YLs and children free. Exhibitor tables: 1st table $10, each extra table $5 each. For additional information, write to Clyde C. Wachter, Jr. WB3KQV, 7317 Ridge Road, Frederick MO 21701.

STEVENS POINT WI
JUN 21

The Central Wisconsin Radio Amateurs, Ltd., will hold its 10th annual Swapfest/Family Picnic on June 21 at Bukolt Park in Stevens Point, Wisconsin. Tables and tailgate spaces will be $2.50, but admission will be free. FCC exams will be given at 9 a.m. at the Blue Top Supper Club. Pre-registrations will be greatly appreciated, but walk-ins will be accepted on a first-come, first-served basis. Talk-in on 146.385/.985, .07/.67, and .22/.82. For further information, contact Jim Benak KA9ACE, 1775 Strongs Avenue, Stevens Point WI 54481; (715)-344-5943. To pre-register, contact Joe Larson N9JW, 644 Portage Street, Stevens Point WI 54481; (715)-344-1182.

SANTA MARIA CA
JUN 21

The Satellite ARC will hold its annual Father's Day Swap-Fest on Father's Day, June 21, at Union Oil Company Newlove Picnic Ground, south of Santa Maria on U.S. 101. General admission is at 9 a.m. Admission is free. Tables are available. Talk-in on 145.14/144.54, 146.52, or 146.55. For tickets and information, write to Santa Maria Swap Fest, PO 5117, Vandenberg AFB CA 93437.

CROWN POINT IN
JUN 21

The Lake County, Indiana, ARC will hold its 15th annual Dad's Day Hamfest on June 21, beginning at 8 a.m., at the Lake County Fairgrounds in Crown Point, Indiana. All tickets $3. Talk-in on 147.60/.00 and 146.52. For further information, contact Ken Brown WD9HYF, 918 Chippewa Drive, Crown Point IN 46307.

WEST COAST JAMBOREE
JUN 22–26

The Inland Empire ARC of Rancho Cucamonga, California, will operate a special-event station on June 22-26 from 1700-0800 UTC in honor of the annual West Coast Jamboree, which hosts 18,000 members of the Girl Scouts of America in their campout at Glen Helen Regional Park in Devore, California. Operating frequencies will be in the General-class phone sections of the 75-, 40-, 20-, and 15-meter bands. The station will also operate in the new Novice and Technician portion of the 10-meter phone band. A commemorative certificate with the Girl Scout Official Emblem will be issued via WA6ZEF when accompanied by a QSL card and a size 10 SASE.

COBOURG 150TH
JUN 22–JUL 5

The Heritage ARC will use the special prefix VX3 from June 22 to July 5 to commemorate Cobourg's Sesquicentennial. Operation will take place in a section of the art gallery in historical Victoria Hall in Cobourg, Ontario. CW operation will be on 3.550, 14.050, and 21.025. SSB operation will be on 3.800, 14.143, 14.200, and 21.250. RTTY operation will be on 14.180. Two-meter operation will be on 146.550. Special QSL cards have been printed, and it is planned to exchange greetings with Coburg, Australia; Coburg, W. Germany; and Coburg, Oregon.

FORT 175TH
JUN 26–28

The Ottowa ARC will operate W8MCB from 1700 UTC on June 26 until 2300 UTC on June 28 to celebrate the 175th anniversary of the establishment of the Fort during the War of 1812. Operation will be in the General portion of 80, 40, and 20 meters. For a commemorative certificate, send QSL and SASE to Paul Baumgarte WD8RJR, RR #3, Box 341, Delphos OH 45833.

CORNELIA 100TH
JUL 4

The Southern Piedmont ARC will operate WD4NHW on July 4 in celebration of the centennial year of Cornelia, Georgia, Home of the Big Red Apple. Listen for operation in the 20-, 40-, and 80-meter bands. For a certificate, send your QSL card and a 9" x 12" SASE to SPARC, PO Box 52, Cornelia GA 30531.

RIVERBOAT DAYS
JUL 4

The Clinton ARC will operate station W0CS on July 4 to commemorate the Clinton, Iowa, Riverboat Days. Suggested frequencies: CW—3.720, 7.120, 21.120, and 28.120; phone—3.875, 7.275, 14.275, 21.375, and 28.400; 2-meter FM—146.480; 2-meter SSB—144.210. To receive a certificate, please send a #10 SASE to Darryl Petersen KD0PY, RR #1, Box 84, Bryant IA 52727.

FESTIVAL OF NATIONS
JUL 4

The Chatham Kent ARC will operate VE3CRC on July 4, from 1200-2200 UTC, to celebrate Chatham Ontario's Festival of Nations. Phone and CW on 80-10 meters, packet and phone on 2 meters. Certificates for a QSL card to Cliff Russell VE3NGG, R.R. #1, Chatham Ontario N7M 5J1.

ABOVE AND BEYOND

Peter H. Putman KT2B
3353 Fieldstone Drive
Doylestown PA 18901

NOVICE VHF/UHF

This month, I'll touch on some of the new privileges in the VHF and UHF spectrum for Novices. Of main concern are the subbands at 23 cm, where Novices will really find themselves above, beyond, and perhaps "way out" unless the current ARRL Band Plan for 23 cm is modified to take them into account.

At present, the Novice 23-cm allocation stretches from 1270 to 1295 MHz, stopping just short of where the majority of weak-signal work is to be heard. As far as the ARRL band plan goes, most of this segment is allocated for repeater inputs, wideband experimental modes, amateur television (ATV), and narrowband FM simplex work. Presently, 1294.50 is designated as the national FM simplex calling frequency.

According to this plan, narrow-bandwidth, weak-signal communications are to be found in the 1295–1297-MHz segment, just out of the Novice allocation. At present, the national CW and SSB calling frequency is 1296.100 MHz—again, out of the Novice allocation. This situation would seem to present a bit of a problem for the newly licensed Novice with a 1296 multimode radio or transverter. Who will he/she work to gain that valuable experience in weak-signal operation?

Now, let's look at it from the view of established 23-cm operators. Most weak-signal enthusiasts employ linear transverters, upconverting from either 144 MHz (most common) or 28 MHz (not as common). In the former, the local oscillator (LO) frequency is typically 96.000 MHz. This is multiplied 12 times to 1152 MHz, then combined with the intermediate frequency (i-f) of 144 MHz to result in a 1296-MHz signal. In receive, the process is reversed.

That means that an operator with a 2-meter multimode driving a transverter will be unable to transmit out-of-band (i.e., below 144 MHz) to gain the desired conversion frequency of 1294 MHz or so to work the new Novices. But the problem is easily solved, as simple math will show. Changing the LO to 95.8333 MHz will now result in a frequency conversion of 144 to 1294 MHz (95.8333 x 12 = 1150 + 144 = 1294 MHz)!

Now we've picked up the new subband and can still operate weak signals at 1296 MHz (downconverting to 146 MHz). A side benefit is that strong local 144-MHz signals won't "leak through" the transverter as images and be confused with 1296-MHz signals (this happens quite often during contests, especially in a multi-operator station).

The other benefits are obvious: Any 1296-MHz gear will easily cover 1294 to 1295 MHz, as it is a shift of less than .0025% in frequency. That means all existing equipment and antennas can readily be employed by the new Novice as well as the seasoned 23-cm operator. And that's a lot of stuff—loop yagis, conventional beams, power dividers, receive converters, and preamplifiers, just to name a few items.

Band Segment	Activity
1260.00–1288.00 MHz	As specified in the ARRL band plan
1288.00–1293.00 MHz	Wideband experimental, simplex ATV
1293.00–1294.00 MHz	Narrowband FM simplex, 25-kHz channels
1293.50 MHz	National simplex calling frequency
1294.00–1295.00 MHz	Weak-signal modes (SSB, CW—No FM)
1294.200 MHz	Novice weak-signal calling frequency
1295.00–1300 MHz	As specified in the ARRL band plan

Table 1. Suggested amendments to the 1985 ARRL band plan.

> **"I believe the framers of the ARRL 1.2-GHz band plan did not imagine a Novice allocation at 23 cm anytime in the near future."**

Band Plan Needed

Okay, now we have a way to work those Novices during contests and activity nights. The next step is to change the band plan accordingly! The original ARRL band plan was drawn up long before Novice Enhancement became reality, and I believe the framers of that plan did not imagine a Novice allocation at 23 cm anytime in the near future. Guess what, folks—the future is now. And now is the best time to change the plan before the band becomes too congested to do otherwise.

Why all this emphasis on a band plan? Put yourself in the position of a Novice looking to purchase a 23-cm radio. Would you know where to look in all of your 25-MHz subband to find FM simplex? Repeaters? ATV operators? SSB? OSCAR inputs?

Think of the band plan as a road map. Having to scan through 600 possible FM channels on 2 meters to find a repeater near you or an active simplex channel is bad enough. Having to scan through over a thousand possible channels to find FM, SSB, or CW activity would take forever—especially considering the localized, point-to-point nature of most 23-cm communications.

So our new Novice will most likely turn to the band plan and operate the prescribed modes, as it seems the best way to contact somebody who is also likely to be on the same frequency in the same mode! Most band plans on lower VHF frequencies have come about largely by default. By that I mean that these plans merely recognized the operating standards and mode subbands already in place and made them official. But 23 cm is a different situation; it's still relatively unoccupied so that the flexibility is there.

All folks with a stake in 23 cm have a stake in the band plan as well. This includes manufacturers of transverters, transceivers, preamps, and antennas. It also includes the contesters who'd like to work a few more grid squares and prefixes during contests and those folks who sit on 1296.100 MHz every Thursday night calling CQ for hours on end.

With all of this in mind, I'd like to suggest the amendments to the 1985 ARRL band plan shown in Table 1. What is actually proposed here is to take away 1 MHz from the wideband experimental/ATV simplex allocation at 1288–1294 MHz and designate it for weak-signal work. This way, users of 144-MHz multimodes can select the 95.8333-MHz crystal option and extend their coverage to take in the newly created weak-signal subband. It would also allow Novices to use equipment and antennas currently on the market with no modifications or retuning.

I've been discussing this idea with some equipment manufacturers, and they agree that the idea makes sense. Those wanting to work the simplex activity on 1293 MHz could either add a separate FM transceiver (an approach used by 220-MHz weak-signal operators) or use a different conversion scheme in their transverters. Those with multimodes on 23 cm will, of course, have no difficulty at all in dialing around to find the activity.

Most importantly, such a plan will give Novices a taste of what it's like to make weak-signal UHF contacts—opportunities that do not exist for the Novice on 220 MHz. (The subband there all but precludes SSB and CW modes.) Such experience might be an incentive for the Novice to upgrade and explore such modes on 50, 144, 220, 432, and 902 MHz. Remember, with 5 Watts, good low-loss feedline, and 20–30-element yagis, contacts of more than 25–50 miles are indeed possible (and quite entertaining if multipath or enhanced propagation is present).

CONTESTS, CONTESTS

Yes, it's June again. Time for

Photo A. It's time to head for the hills again as summer VHF/UHF propagation arrives.

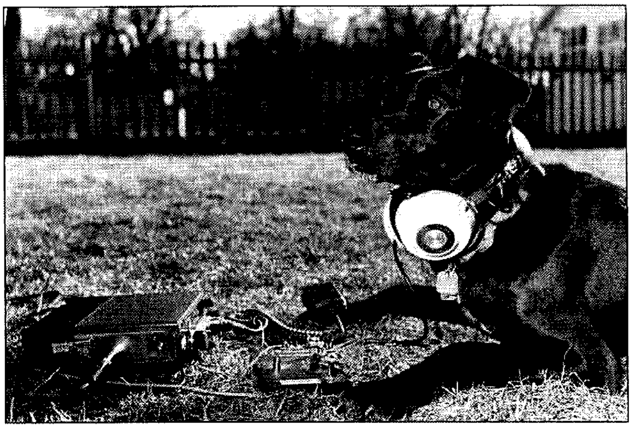

Photo B. The dog days of summer are not far away. "Crescent," the most famous quadruped in the VHF/UHF bands, prepares for the contest season.

the summer contest season! For those of you who can't see the appeal of a low-band contest, try your hand in one of these for a change: ARRL VHF QSO Party (June 12–13), *CQ* Worldwide VHF WPX Contest (July 17–18), ARRL August UHF Contest, and the ARRL September VHF QSO Party (September 12–13). Why should you? For one, it's an easy way to pick up a bunch of rare grid squares. Sporadic-E on 6 and 2 meters is nice. It's even better when it happens during a contest! With all of the strong Es openings the first few months of 1987, it looks as if 6 and 2 meters will be hopping in May, June, and July.

With the advent of the QRP class in the ARRL contests, all of the events now recognize the efforts of "the little guy"—the mountaintop operator or portable/mobile station who treks to a rare grid to make a few contacts with a 10- or 25-Watt multimode. (In the ARRL rules, QRP is 10 Watts or less. Under the *CQ* WW rules, QRP is 25 Watts or less.) Not only that, in the *CQ* contest, you can actually qualify under any of four categories on low power and if you win, get a nice trophy for your efforts.

I am one of the co-chairmen of the *CQ* VHF WPX committee. Recently we completed scoring and compiling the logs from last year. You'd be surprised to see how competitive some of the QRP stations can be. How about 286 contacts and 120 prefixes on 50, 144, 220, and 432 from Chicago? Or 329 contacts and 50 prefixes portable in Washington state? The fifth highest score from the 1 call area was a QRP operation! Other QRP stations were fifth in the 2 call area, first in the 3 call area, and second in the 6 call area. Not bad for under 25 Watts!

Of course, QRP operation is very popular in Europe, and we received many logs from Italy and Hungary where the average power used was between 10 and 25 Watts on 2 meters and/or 70 cm. Logs from Romania indicate an interest in QRP there as well, with virtually all of the equipment there being home-brew. Think about that as you spin the dial on your IC-271. On the higher bands, most gear is home-brew on 902, 1296, and 2304, with power levels in the .1-to-5-Watt range.

Admittedly, the range of equipment available for portable operation here in the U.S. is limited. You could take a mobile multimode out in your car or with a storage battery for a fair number of contacts. You could also decide to work FM only and use a hand-held with lots of spare batteries. Indeed, the *CQ* contest has an FM-only category, with this year's winner working 137 stations and 36 prefixes on three bands—144, 220, and 440 MHz. The equipment used consisted of three hand-helds and one mobile radio, powered by batteries from a nearby drive-up mountaintop.

Look for a review soon of a typical portable 2-meter mountaintop station, employing the Yaesu FT-290R MKII and Tonna 9-element portable 2-meter beam. The latter is a slick product in that NO tools are needed to assemble it, and only one wrench (8mm) is needed to attach it to a mast of some sort. I'll have used this combination from a nearby mountain during the ARRL 144-MHz Sprint in April, and you'll find out just how well the combination worked out. I'll also be trucking up another hill for the ARRL 50-MHz Sprint in May with a similar combination of Yaesu FT-690R MKII and Tonna 5-element 6-meter beam, and you'll see the results of that trip in a later issue.

In the meantime, I expect you'll be out there somewhere making contacts on at least one of these contest weekends. The contest periods are long enough so that you can take some time off as needed and mow the lawn, make a shopping trip, go swimming, or have a nice barbecue between operating periods. If you have a particularly interesting scheme for a portable setup, drop me a line and some pictures. We'll print them here and let others know about it! (The best one I've heard so far: an FM expedition up the World Trade Center for the *CQ* VHF WPX. That would be quite an interesting trip—might set the all-time FM-ONLY record!)

On The Road Again

By the way, our SCORE group (Society of Contest Operators and Radio Experimenters) has decided to activate a six-band station from Chincoteague Island, Virginia, in grid FM 27 for the June VHF QSO Party. We'll be active on 50, 144, 220, 432, 902, and 1296 MHz with about 100 Watts per band and single yagis. The entire setup will run from a van, and all antennas will be perched atop a custom-made tower trailer, using a TriEx W51 crank-up. We had decided that the grid was too quiet during contests, and conversations with other VHF/UHF types indicate that they would welcome the operation.

Look for us on the bands you need from 1400 EDT Saturday until 2300 EDT Sunday!

Addendum

Here are a couple more contests that might tickle your fancy. On June 19–21, the SMIRK 50-MHz Party will come alive. It starts at 1900 CDT Friday June 19 and runs until 1900 CDT Sunday June 21. Points are scored for contacts and grid squares (2 points per SMIRK member contact, 1 per non-SMIRK member). Certificates will be awarded in ARRL sections and foreign state, province, prefecture, or U.K. shire/county/region. For more information, contact Lisa Lowell KAØNNO, PO Box 547, Hugo CO 80821.

If 2 meters is your bag, how about the SWOT (Sidewinders On Two) Contest, which is being held the same weekend as the ARRL UHF Contest (August 1–3). This way, you can work two contests at once! It starts at 1900 UTC August 1 and ends 0400 UTC August 3, and only SSB or CW contacts are permitted. The exchange consists of callsigns, grids, and SWOT numbers. As in the SMIRK contest, contacts with SWOT members are worth 2 points each and with non-members 1 point each. Certificates are awarded for high score in each ARRL section. For more information, contact Jerome Doerrie K5IS, Rte. 2 Box 72, Booker TX 79005.

I've received some other mailings on contests, but the details were too sketchy to reprint here. If your club or organization is sponsoring such an event, be sure and drop me a line so I can get it into print quickly. Until then, see you Above and Beyond! ■

NK6K > PACKET

Harold Price NK6K
1211 Ford Avenue
Redondo Beach CA 90278

COOED TRANSMISSIONS

So there I am, standing in line with my wife, waiting to have our "eight items or less" death-rayed by the monochromatic eye of the scanner at Ralphs, the local supermarket. We had all the makings of nachos: a bag of tortilla chips, a can of mild cheddar cheese dip, and a jar of Jalapeno peppers. The deal is, you put the chips in a bowl, heat the cheese and pour it over the chips, and then top it off with the peppers. Then you eat this amalgam until you break out in a sweat. This is also a good way to burn holes in your stomach, useful for people who are too lazy to earn their ulcers the old-fashioned way.

Anyway, the bar codes got scanned, the prices computed, the bill totaled; and then came the indication that Big Brother was alive and well and living in a PC in the basement of Ralphs. At the end of the receipt was this: "Ralphs offers you the coupons personalized for the people who use them: Save 20 cents on one pound of Velveeta Mexican Cheese, Hot or Mild."

Some Artificial Intelligence algorithm in a chunk of impure silicon had made an educated guess at what I could be enticed to purchase on my next trip. It's scary enough if the choice was made based on a single item, probably the nacho chips. It's even scarier if the deduction was based on matching two items, the regular cheese and the Jalapeno peppers. Velveeta Mexican is a combination of the two.

Because we paid by check (Californians never use cash; you can't tell where it's been), the computer now knows who we are, where we live, our phone number, and my wife's driver's license number. I have not been back to Ralphs for fear that I'll get a message on the next check saying, "Hey, you forgot your cheese."

Just as technology is taking over the supermarket, so it goes with packet radio. For some reason, packet strikes fear into the hearts of the FCC monitors up at the Belfast, Maine, monitoring station. Just before I started on this column, I got a copy of the NEPRA *PacketEar*, the newsletter of the New England Packet Radio Association. These guys have got the snazziest four-page monthly newsletter I've seen—nice layout, photos, lots of flash. Dave W1TMO is the editor. In the April issue was an article by Steve W1GOH about the citing of the WA1OJB BBS by the FCC for transmitting encrypted information via packet radio.

It seems that the WA1OJB BBS contained binary files that were encoded in such a way as to make them transferable through BBSs. When typed out, these files look like trash and are certainly not clear-text English. Part 97 has some unfriendly things to say about that sort of thing. There are several items worth discussing here.

> ***"There are two reasons why amateurs need to encode data: to send binary files through forwarding BBSs and to compress data to send it faster."***

Codes and Ciphers

First, I'll look at the parts of the rules that are causing the problems in Maine:

"97.117 Codes and Ciphers prohibited. The transmission by radio of messages in codes or ciphers in domestic and international communications to or between amateur stations is prohibited. All communications regardless of the type of emission employed shall be in plain language except that generally recognized abbreviations established by regulation or custom and usage are permissible as are any other abbreviations or signals where the intent is not to obscure the meaning but only to facilitate communications.

"97.69 Digital Communications. Subject to the special conditions contained [below], an amateur radio communication may include digital codes which represent alphanumeric characters, analogue measurements, or other information. These digital codes may be used for such communications as (but not limited to)...transference of computer programs or direct computer-to-computer communications ...provided that such digital codes are not intended to obscure the meaning of, but are only to facilitate, the communications."

What that all says is that you can't send anything where the intent is to keep other people from finding out what you're sending. Note that there is no requirement that a message, even in its original form, be plain-text English. Computer programs are allowed, as is any form of raw data. Other than that, you can encode the information in any manner you want to facilitate communications.

Unfortunately, there is little difference between "encrypting" a string of data and "facilitating" a string of data. The only difference is that in encryption the hope is that only the intended recipient can reverse the process; in a facilitated file, anyone should be able to do it. The requirement laid out by Part 97, then, is that facilitated data must be able to be converted back into its original form by anyone, and that the data in its original form must be legal for transmission over amateur radio.

Why Some Files Need To Be Facilitated

There are two basic reasons why data needs to be modified from its original form. One is when the data won't go through the network in an unaltered form (the transparency problem), the other is when you want to compress the data to make it pass through the network faster.

A problem that has been with us since there were computers is something called transparency. You usually want a transparent data path (i.e., the data is unmodified as it passes through the medium). Clear glass is transparent to visible light; light is unmodified as it passes though. Glazed glass, or the type of glass in bathroom shower doors, is not transparent, it is translucent; light passes, but the rays are bent or scattered.

In the world of computer networks, data paths are seldom transparent at their lowest level. Steps are taken to make the path appear to be transparent. This usually requires that the data be modified in some way. One of the least transparent data paths is the Baudot-based telex network. This network passes only about 64 different character codes, and all messages must be converted to uppercase characters.

On the other end of the scale is AX.25, which promises that user data will be transparent: You don't have to modify your data to send it through AX.25. The AX.25 protocol offers complete transparency to its users, but only at the expense of modifying the data as it is sent, behind the scenes. In the AX.25 protocol, this process is called bit-stuffing.

AX.25 sends user data in eight-bit bytes, allowing 256 user codes. AX.25 has a requirement, however, to identify the start of a frame of data. It could steal one of the 256 user codes as a start-of-frame flag, but then one code could not appear in the user data. This would make the protocol nontransparent, like a piece of stained glass that cuts out some frequencies of light.

AX.25 solves this problem by modifying the user's data; any time there are five consecutive one-bits in the user's data stream, a zero-bit is inserted. Once this is done, AX.25 can make unique characters by defining a string that has more than five one-bits. On the receiving side, if five one-bits are seen followed by a zero, the zero is removed.

This can be done because a zero is always added after five ones by the transmitter. Anything with more than five ones is a special AX.25 character. There are many other ways of doing this, but all of them involve defining a special sequence of bits or bytes and then modifying the user's data so that the special sequence is never present.

Using bit-stuffing, AX.25 looks to the user as if it is transparent, so theoretically, you could send transparent data through the network. In 1987, though, the majority of our "network" is built with a series of devices called "forwarding BBSs." These systems, described in earlier columns, are not transparent.

The WØRLI-style BBSs define

certain special characters that perform various functions. For example, the end of a message is marked with a hex 1A (a control-Z). A computer program could be sent encapsulated inside a W0RLI message as long as it didn't contain a control-Z other than the one that marked the end of a file.

The W0RLI BBS also uses a mode of the TNC which by definition is nontransparent. Only the bottom seven bits in each byte are valid; the top bit is ignored. While this is fine for text messages, it won't do for binary computer programs, which are notorious for wanting to use all eight bits.

Therefore, to send a computer program through the auto-forwarding BBS network, you must modify the program from its original form to a form that will pass through the network. It must be encoded to facilitate its transmission.

The easiest way to modify an eight-bit file to pass through a seven-bit transmission medium is to split each eight-bit character into two four-bit characters, setting the high four bits of each to 0. Thus, 11010011 would become 00001101 00000011. Then, to avoid using special characters normally found in the 0–16 range, you could always set the seventh bit. For example, a control-Z in the original user data (00011010) would become 01000001 01001010. On the receive end, you would throw away the high four bits and combine the bottom four of each pair to get back the original data.

Unfortunately, the above algorithm has exactly doubled the size of the message. A program that was originally 800 bits long is now 1,600 bits. The high-order bit (the one on the left) has to be zero because only seven bits are sent. The next bit has to be one to avoid special characters. The next two bits, however, are wasted. They could be used for data but aren't. A more efficient scheme would use those bits for user data.

You've seen why a program must be modified to be passed through the forwarding BBS network. There are many ways of performing the modification. The one WA1OJB was using is called BSQ, and it has been well documented and distributed in the BBS community. Anyone can use BSQ to convert the modified program back to its original form.

Compression

There is another reason to modify data, even (and especially) plain text. In a plain-text message, most people use only a small subset of the total of 256 possible characters. With upper- and lowercase, punctuation, and numbers, most people use fewer than 80 characters. In addition, some messages contain repeated characters, such as spaces, dashes, etc.

There are many (many) ways to compress messages based on the above attributes of text messages. Anyone who has watched "Wheel of Fortune" has caught on to the fact that some characters appear in words more often than others. E is very popular, X is not.

Imagine that you scanned a long message and sorted each character by the number of times it appeared in the message. Just seven characters might make up more than half of the message. Take those seven characters and encode them in three bits. Half of your message can now be sent three bits per character instead of eight.

With a smart program, you can compress almost any message and gain some transmission time. For example, using a standard compression program, last month's column (before editing) of 16,000 characters compressed down to 9,146, or 43 percent. A file like the AMSAT orbital elements, which contains mostly numbers, compressed 60 percent. I suspect we'll see more data compression in the future as the packet frequencies continue to fill up.

To review, you've seen two reasons why amateurs need to encode data: to send binary files through forwarding BBSs and to compress data to send it faster. Our responsibility to the FCC and to our fellow hams who must carry the burden of the self-policing aspects of the amateur radio service is that the encoding scheme must be able to be applied by anyone with suitable equipment. The algorithm should be readily available; the best way to do this is to get it published. The ARRL computer networking conference proceedings are a good place. In lieu of that, algorithms must be available on request from a fellow ham or on demand from the FCC.

We also need to carry out an education plan, both internally in the amateur service and in the FCC. The latter is particularly obvious in the case documented in the NEPRA *PacketEar*. Everything went right, almost. The FCC engineer questioned the encoded data and asked the originating station for the clear text. WA1OJB complied, sending a copy of the original program and an explanation of what it did.

Unfortunately, things fell apart when the FCC engineer complained that the encoded file and the original file were different lengths. His conclusion was that there were, therefore, two different files. As we've seen from the above discussions, encoding to avoid a transparency problem is almost guaranteed to make the size different; usually the encoded file will be bigger. To make up for this expansion, the BSQ program also goes through a compression pass, which in this case made the encoded file smaller than the original.

"The W9ZRX list of inter-linked forwarding BBSs in North America stood at 404 in late March."

The ARRL has been called in to assist in the WA1OJB case; hopefully it will have been resolved by the time this comes out. Encoding will become more common as higher level protocols become more common. And the sooner the enforcement glitches are worked out, the sooner we can take the next quantum leap in networking. The W9ZRX list of inter-linked forwarding BBSs in North America stood at 404 in late March. There is no count of total BBSs. The numbers will only get bigger in the months ahead, and the problems will grow more complex.

SHORT SUBJECTS

Ralph KB0LO writes asking about small TNCs. He says, "Harold, I'd be interested in hearing about some of the new packet applications you hinted at in your May *73* article—in particular, anything involving improvements in portable (meaning REALLY portable) stations. I'm involved in sailplane racing and could see some pretty awesome possibilities for a unit about twice the size and weight of a handie. It could do without a lot of bells and whistles—thumbwheel frequency selection and a 40-column display would be fine—but it would have to be an excellent performer at hitting repeaters from way out (the point here is after-landing, not in-air performance). Have you seen anything smaller than the briefcase installations?" Anyone have news on a small, integrated unit?

A report from Nob JA1KSO via Hank W0RLI says that there are 30,000 JA stations on packet and that the 70-cm band is now almost totally devoted to packet operation. There are 100 packet BBSs in the Tokyo area and more than 500 in all of Japan. There is no indication of whether these BBSs are inter-linked.

Activity on the UoSAT-OSCAR 11 Digital Communications Experiment is picking up. See the August, 1986, *73* for details on the UO-11 DCE.

Graham VK5AGR in South Australia is now on the air, and message transfers between WESTNET and VK have already occurred. A station tied to EASTNET should be up in the next two days. The only step remaining is for the station to receive software I mailed yesterday.

Two amateur radio DCE stations have been set up in Pakistan as part of a joint project between the Pakistan space agency and the UoSAT group at the University of Surrey. Jeff Ward K8KA, past and perhaps future editor of the ARRL *Gateway* newsletter, is a research fellow at the University of Surrey and is currently in Pakistan helping to train the hams there in DCE procedures.

Hopefully we're in a position to demonstrate store-and-forward satellite communications on a regular basis. Traffic to VK may be routed through the network to NK6K for retransmission via UO-11.

That's it for this month. I promise this is the last month where "Wheel of Fortune" will be mentioned. ■

ATV

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Q & A

This month is devoted to questions and answers. Pat, my secretary, and I have assembled many of the questions you have asked of us. Let's get started with the most common ones:

Q: What is the difference between fast- and slow-scan TV?

A: Basically, fast-scan TV is "live" standard television just as you see from ABC, CBS, NBC, and PBS. It is NTSC 525-line color or black-and-white TV pictures with 4.5-MHz offset audio subcarrier sound. The range on FSTV is limited on an average night (dependent upon terrain) to about 50–100 miles. On UHF band openings, you can work distances of 200 to 1,000 miles (but it happens only a few times per year).

Slow-scan TV, on the other hand, is a "still-frame," slide-show type of video communications medium. Today's SSTV offers both color and black-and-white images and high-resolution pictures. You'll hear some slow-scanners say that the picture they just received looks as good as commercial TV pictures and, indeed, they might to the naked eye. But, in reality, slow-scan has a long way to go to achieve the number of dots per inch and 525 lines that FSTV offers.

SSTV pictures are mostly sent at 8-, 12-, 16-, 24-, 32-, 36-, and 72-second frame rates. The neat pictures can travel as far as your HF gear and propagation can take you. Africa, England, Germany, Australia, Japan—there is no limitation to sent and received SSTV signals.

Cost to get started? Fast-scan TV is much cheaper if you look at basic transmitters, receivers, and antennas. Surplus and home consumer VCR-type cameras can be used on both modes.

Which mode is right for you must be determined by what is going on in your area. If there is no fast-scan TV, start with SSTV, then develop a FSTV group of your own. To find out what UHF FSTV is going on near you, send me an SASE.

Q: We are a new group of fast-scan TVers and would like to put up an ATV repeater. What do you recommend for equipment?

A: I don't advise brand new ATV groups to take on a complicated ATV repeater project right off. Even if you get one built and working (and that is saying a lot!), you will discourage the natural building progression of individual stations by "making it easier" for everyone to see each other's signals.

Now that may sound improper since our amateur fraternity is structured so heavily on the use of repeaters these days, but it is true. Think about it. Many will get on 2 meters with a hand-held and a rubber ducky, and for some that is as far as they will ever get.

Take away the repeating device and they are forced to put up beams, higher power amplifiers, preamps, better coaxial cable feedlines, etc. The same is true for UHF fast-scan TV. Force and encourage your aspiring new ATV group to work simplex for a couple years. Have fun working distant DX and getting P4–P5 pictures 30–50 miles away!

After a couple of years, when you have 10–15 active members, then and only then should your group go after a repeater project! When you get to that point, write to me and I'll send you a "How to Build an ATV Repeater Kit."

Q: What antennas do you recommend for fast-scan?

A: That's a tough question. Are you a builder or a buyer? If you are a builder, K2RIW-constructed antennas—cut for the ATV portion of the band—are a good way to go. You can obtain the critical parts and elements, etc., but you must construct your own booms. Write to Gerald Cromer K4NHN in Cayce, South Carolina, or Dave Williams WB0ZJP in St. Louis, Missouri, for more details and comments.

Of course, you can always home-brew an array. Back issues of *The USATVS Journal* give a number of designs, facts, and figures.

Buyers can order the popular 6-, 16-, or 27-element KLM. Spectrum International in Concord, Massachusetts, distributes the most popular ATV antenna—the incredible Jaybeams, made in England and imported into the U.S. by G3BVU/1. There are three models for ATVers: the 28-, 48-, and 88-element versions. See Spectrum's ads in leading amateur journals.

Q: How much attention do I really need to pay to my feedline on UHF ATV frequencies?

A: A lot. Even the once popular Belden 8214 tight braid and shielded RG-8/U-type coaxial cable will show a 50% loss factor on just a 100-foot run! Put 100 Watts in one end and see about 40–50 (if you are lucky) come out the other.

Today's standard requirement is Belden 9913 or an equivalent. With that kind of good line, you'll lose only about 1/4 of your power on transmit and receive. Hardline is the ultimate way to go, but it can also be the most expensive. The most popular type of cable used by today's ATVers is 1/2-, 3/4-, or 5/8-inch Andrews 50-Ohm line (according to studies conducted by the USATVS in 1985).

> ***"I am confident that I will make it into New York someday from here in Iowa on UHF ATV."***

You can get by with some cheap or many times free CATV 75-Ohm stuff, but you suffer your intended gain when you start home-brewing connectors or not using a matching device to get down to a 50-Ohm antenna and rig load. You are better off going with Belden 9913 than with free CATV cable. The bottom line for serious ATVers is to "think with your pocketbook."

Q: Do outdoor preamps placed near the antenna really make that much difference, even if one were using low-loss hardline?

A: Yes, they certainly do! Any time you add 15–20 dB of gain near the antenna and ahead of the receiver, it is going to make a dramatic difference in the signal strength level you will see on your TV set! It's like adding a stacked set of 12 antennas.

One of my local ATV buffs who reads this column razzed me the other day about a statement I had made in the April issue about getting P4 to P5 pictures 40–50 miles out from the N9CAI ATV/R system. He is 25 miles out (pretty near "line of sight"), but he receives only P2 to P3 pictures at best. I told him that I am the same distance (actually farther out, in a valley and under some pretty heavy rolling terrain) and I receive P4 to P5 pictures all the time from our repeater.

When we get into this argument, I point out that his insufficient cable run and his lack of a preamp at the antenna (he likes to keep his ARR GaAsFET literally in the ATV box in the shack) are his big limiting factors. To his credit, he does run a dual-stacked 88-element Jaybeam array at good height.

If I were to move my shack to his location with the same equipment I am running here, I guarantee my entire ham station that I would have absolutely P5 color pictures ALL THE TIME, day or night! The other day, I went horizontal mobile in preparation for our group's local 2nd annual BRATS Transmitter Hunt. With a measly 6-element KLM yagi, six feet of 8214 coax, and an average (not hot) MRF-901 PC downconverter, I saw P5 closed-circuit pictures in my car at the back end of an interstate McDonald's parking lot just ten miles from his base QTH (at ground level!).

Hopefully, someday my good friend, who has been with me from the start, will get with it, spend a few more bucks on a mast-mounted preamplifier and coax, and do things right so he, too, can read the fine-print messages on "low power" from our repeater. He will then be real competition when the DX rolls in!

Mast-mounted preamps on receive can be inexpensive. The ones that allow the ATVer to "transmit" through them are indeed more expensive, but you get what you pay for. Write to Advanced Receiver Research for brochures or contact the good people at TNT Radio Sales in Minneapolis, Minnesota.

Q: I have an older black/white SSTV converter. The color SSTV gang hardly ever sends B/W picture transmissions. How can they forget those with B/W setups?

A: Don't let them forget! Don't be intimidated by the color giants! Let them know you are there and that you *do not* have color SSTV equipment!

The Saturday afternoon W1JKF/W9NTP SSTV net (1800 UTC) on 14.230 MHz does indeed retransmit most of the pictures in B/W formats. Some have wanted to see color and B/W separated into different frequencies. I think that would be a mistake. Slow-scanners have always had a difficult time just to maintain the known calling frequencies that they have established. To split them up even more would be disastrous!

Load in your best contrasted picture and let it fly over the airwaves. State proudly that you are sending and receiving in "living black and white." Get in there and tell 'em you're a first-class citizen, too! (Then start saving your money for a Robot 1200C while you are battling.)

Q: Why is it that FAX just doesn't seem to be catching on here in the United States? In Japan and elsewhere, quality, higher resolution facsimile signals are transmitted and received by radio amateurs daily.

A: Good question. There has been a limited number of FAX transmission contacts sent from the U.S. over the past couple of years. You'll find it happening mostly on weekends on 14.240 MHz, just above the SSTV calling frequencies. Since the Martin Goodman TRS-80C CoCo FAX Transmit program came out, activity has increased a bit. (For those of you with Radio Shack older gray 64K CoCos, write me for information on Goodman's FAX Transmit program. Send an SASE.) It still remains transmitted largely among local VHF ATV mode groups, though. Weather pictures are captured and retransmitted primarily.

There is tremendous interest in this as-yet-untapped visual medium. When the commercial HF rig manufacturers realize the interest out there in FAX and add a special mode switch position for reduced power and when the SSTV manufacturers add in the slower FAX transmission clock speeds to their dual converters (as has the German Volker Wraase DL2RZ with his SC-1), or when surplus FAX "transmitting" equipment becomes readily available at an affordable price, then and only then will you see commonly heard activity for the U.S.

We still need a few brave souls who will take this medium on with a vengeance and get people going with a real sleeper of nifty capability. The FCC okayed its use. Why not develop it? Ralph Taggart, Clay Abrams, Fred Sharp, Rual Alvarez, Martin Goodman, and others have done a good job of creating the amateur revolution on "receive," but we need these and other leaders to get in there and "transmit" it!

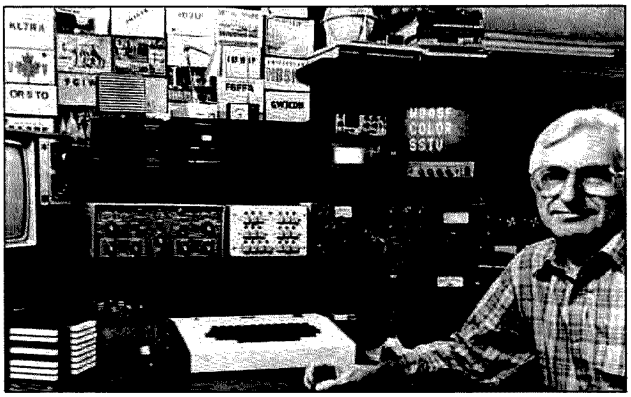

Photo A. Fred Sharp W8ASF of Cleveland, Ohio, and his elaborate SSTV station.

Q: What if your local area has no fast-scan activity? What antenna polarization should a beginning group then go with?

A: In nearly every area of the U.S., FSTV DX is reachable and obtainable for extremely long distance contacts if the band is just right and your station is aware and ready to take advantage of the opportunity. I am confident that I will make it into New York someday from here in Iowa on UHF ATV. It could have very well happened last Thanksgiving had New Yorkers been horizontal and looking out this way (with power). Although 200-to-600-mile ATV DX may seem unrealistic to you right now, stranger things have happened.

Look around you for several hundred miles and "see" what polarization others are using. (Get a copy of *The USATVS North American ATV Directory* for this information.) Analyze, if you can, when there are different groups using both polarizations. Which ones are the DXers? They will most likely be the ones using horizontal polarization.

Most UHF repeaters are very limited in coverage range (10–30-mile radius at best). Repeaters can be built in either antenna polarization mode. Wide-range (40–100-mile radius coverage) H-plane ATV repeaters are growing in popularity due to recent new thinking.

Properly phased beams or multi-slots can show as much gain (if not more) than a good groundplane setup. You can work mobile or portable ATV in either mode. Some vertical proponents claim 1950 studies by the U.S. Navy that "it just doesn't make any difference technically," but there are a lot of 1980 active VHF/UHFers out there who will tell you differently (that horizontal is best just for the fact of getting away from manmade noises).

If you are in a crowded metropolitan area where 440–450 FM is active, there might be something to say for operating ATV at 20-dB rejection when going horizontal (and being able to work 432-MHz SSB as well), but then again, maybe you would like to be part of the 440–450 crowd, too, and thus keep your antennas vertical for double duty.

In other words, it is really up to you and your group. You are in the driver's seat! If you are the first in your area, YOU must make the decision. Do it wisely and intelligently—not based on one person's initial decision. After a dozen or so get on ATV with you, it is very hard to get them to change polarizations later on. If it is absolutely a tossup question, go with the trend of the rest of the country and go horizontal.

Q: Will FM TV replace and outdate our present AM-modulated TV transceivers? Where can we get more information about it? Everyone seems to have different opinions on its legality on the 70-cm band. Is it legal to operate FM ATV on 439?

A: Most likely FM TV will not overtake the popularity of AM TV, at least not until well after your lifetime subscription to *73* or *Spec-Com* runs out! There are many pros and cons about FM versus AM on the TV communications mode. This is to be the subject of great debate this year at the Dayton ATV forum (this column was written in early April). Bruce Brown WA9GVK, a proponent to FM TV experimentation, will be one of the guest speakers.

Basically, the U.S. commercial TV market is infiltrated with AM-designed sets. Changes even into a high-definition mode are unfortunately meeting with great resistance. It would take an unbelievable consumer "sweeping rage" to successfully mass-market FM TV receivers. Its time will slowly come, however, to the hi-fi/stereo buff crowd who likes to be part of the edge of technology.

TVRO systems employ FM TV. Some are using satellite receivers and monitors for FM ATV experimentation. Some simply "slope detect" FM-transmitted pictures on a standard AM TV set at reduced quality.

As for radio amateurs, experimentation with FM ATV is just beginning here in the U.S. FM fast-scan has been a reality in England for quite some time now on higher bands. You can find more technical information about ATV and commercial FM TV in the 1987 ARRL *Handbook*.

It is good for AM ATVers to begin experimenting with the mode. There is nothing written in any text that ATV must be limited to the current standards determined by the broadcast industry. It never has. It has just been convenient to follow in the technically accepted footsteps.

As for being legal or not, I see nothing in the Part 97 FCC Rules and Regulations that prohibits the transmission or reception of FM wideband TV signals in the 420–450-MHz band. Under 97.61 Authorized Emissions, it lists no restrictions about wideband FM on 70 cm. In the ARRL *Guide to FCC Regulations* (6th edition, p. 4-13), the comment is made that "no special bandwidth limits apply above 420 MHz." There are stations in the country now experimenting with FM TV transmissions within the 420–450-MHz band. It is agreed, though, that specific clarification on this matter should be brought to the attention of the FCC (the USATVS has already done this).

Well, gang, that is about it for this month's column. Keep the mail coming, and I'll see you next month with my special Dayton ATV report.■

QRP

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FIELD DAY TIPS

The last weekend of June is Field Day. Without a doubt, THE weekend for QRPers. I can't think of anything else I would rather be doing, except being in a romantic embrace with Vanna White on a small deserted island while monkeys played from the tops of palm trees. But, alas, she's a member of the "Hate Mike Bryce Club," and I've only been out of Ohio once, so dream on, Mike.

Field Day entices many QRP operators into the field for 24 hours of operating simulated emergency conditions. Field Day is a natural for the QRPer because his/her equipment operates quite easily from batteries and/or solar power.

Packing up the equipment and heading off into the wilderness of a state park or the woods behind your house and still being able to communicate with civilization may sound a bit romantic, and it is. Just one or two operators, no need to haul out the gas generator, and no antenna crews to feed. Just you, the radio, some batteries, and a couple of wire antennas are all you need. No matter if you make 5 or 500 contacts, operating QRP Field Day will make you feel young again.

The following tips have been sent in by some of the readers of this column. I have not been able to test all of them out, although I will at some point this year.

Site Selection

Some type of planning should go into Field Day. The first thing you should do is plan the site. Of course, two categories should be applied:

1. Does the site offer a good antenna location?

2. Does the site make for a good camping experience? Even if the site is a top-notch antenna location, do you really want to camp out on top of a hazardous waste dump? Think on that one a bit.

Aside from antenna-supporting trees, site selection should follow criteria ordinarily used in selecting a camping spot. Don't set up shop near TV or commercial radio transmitters. By all means, you don't want to install antennas near high overhead power lines. Besides the noise that the lines generate, you could be killed if one of the antenna wires touches the power lines.

If you're taking the family along, does your site have sanitary facilities? How about a lake for fishing and boating. When bringing along the family, plan for them also, unless your wife likes to run high-speed CW on the low end of 20. If that is so, tie her down in front of the radio.

If you explain the reason for all this craziness to either a private property owner or a state park ranger, you should not have trouble getting permission to raise up the antennas. Don't set up a station without permission!

"Even if the site is a top-notch antenna location, do you really want to camp out on top of a hazardous waste dump?"

Antennas

Without a doubt, antennas are the key to ANY Field Day operation. They can, and do, make the difference. The best antenna for Field Day use? I can't say. Depends on where your site is and what kind of score you're after. (Everyone wants to be in first place.)

For a general rule, use a dipole up as high as you can. Use a slingshot, rocks, a bow and arrow, magic, or even tree climbing. One very high pine tree will hold up a G5RV antenna at 80 feet and will be a real rock crusher.

When selecting a tree to support your wire, remember that heavy tree cover may suck away 2 dB of signal if your antenna is allowed to run through the leaves or branches. Use 30-lb. fishing line or bricklayer's cord to raise up the wire.

I have tried to use a longwire antenna. Photo A shows Dave WD8PTU and me working Field Day a few years ago. We used a longwire that was over 700 feet long. We were planning to rape the 40- and 80-meter bands with that wire. Well, don't you know, we did awful. No more longwires for me.

At first glance, some type of rotatable array would seem the best way to go. There is so much activity on the air that a beam may not make much of a difference. Now don't get me wrong, running low power into less than perfect antennas is not my idea of a good time. However, the work required to install the beam or quad may not be worth all the trouble.

With such intense activity during Field Day, depending on where you're located, it may be best to use a vertical with a good ground system. The reason behind all this, you ask? The very large number of hams in Ohio and the nearby states. I don't really care to beam into Utah. Let those guys work putting up the tower and beam. A good dipole will have some gain, and if it's in the inverted-vee configuration, the legs of the antenna can be moved to favor the best direction.

Some of the guys write that the best "death ray" antennas are the wire beams. Here again, most of these letters come from the W6ers. The Zuni-Loopers have been running a Six Shooter antenna, which is really a broadside array using six dipoles—three in a line and another three above them with half-wave separation. The secret of the array is the twist in the half-wave open-wire transmission line which couples upper and lower elements. The antenna has a gain of about 7.5 dB. This antenna is for only one band; in last year's effort, the Zuni-Loopers Mountain Expeditionary Field Day Force built the antenna for 20 meters.

There are many gain antennas that can be made from wire. Delta loop, lazy quagi, two-element wire yagi, and, of course, the 8JK and Lazy H. Don't worry, I'll be running an antenna column soon to describe these and more.

Station Setup

Many a letter writer asked how to operate Field Day. So for what 's worth, here is Field Day in assillon.

It's best to have a friend along to hare in the work, so I take along my long-haired, hippy friend, Steve WD8MIJ, who is noted for not quite having all his tubes plugged in. So it's Steve and me holed up for our annual weekend of emergency radio lunacy.

For us, a Field Day station should be simple and compact. Why take the complete home station out in the middle of nowhere? Having the Argonaut, with its built-in swr meter, all you need is an antenna tuner, a memory keyer, logs, and goodies.

Field Day is not the time to test out a new rig. That should be done long before. I prefer the Ten-Tec

Photo A. Dave WD8PTU and I trying to work Field Day with a rather poor antenna.

Argonaut models 509–515. The Argosy is also a super radio for Field Day. Just promise me you'll leave the power switch in low position. Both radios have QSK for the CW operator and SSB for those who don't talk with their fingers (Steve). They also have enough power to rack up points, yet low power drain for battery use. To top off the station, we throw in a battery-powered memory keyer to call CQ FD and give the exchange info while we fill in the log.

I always take a "Y" adapter or patch box so that two operators can listen simultaneously. With twin headphones, the second operator can help copy and log. That sure beats having to stare into the canvas tent top while the other guy is having all the fun.

We run our station from batteries, which are being charged via solar panels. I use a Genesis panel from ARCO Solar. We don't bother with wind or hydro power; they're too much work to set up.

Our choice of antennas is quite simple. We use a centerfed zepp in an inverted-vee configuration. My number one rule: "Don't use a beam." Living in the middle of the largest ham population outside W6-land, with New York, New Jersey, Pennsylvania, and Michigan just one high-angle hop away, we would win the contest by just working all of them. Let that guy in Utah waste HIS time with the beam to work us.

After we get to the site, we install the antenna. We use a cheap roll of 300-Ohm twinlead from Radio Shack, 50 feet for less than two bucks. Dig up three different-sized pieces of scrap circuit board from the junk box. Peel the copper off with a knife. Take the largest piece and drill holes for the antenna wire and the twinlead. Place two holes in the other pieces, one for the antenna wire and the other for the support rope. Our support rope is old nylon sash cord or heavy-duty kite cord. While at the store buying the cord, get a roll of duct tape and a ten foot 2-by-4. On the table saw, rip it in half and take it along to the site to make the mast.

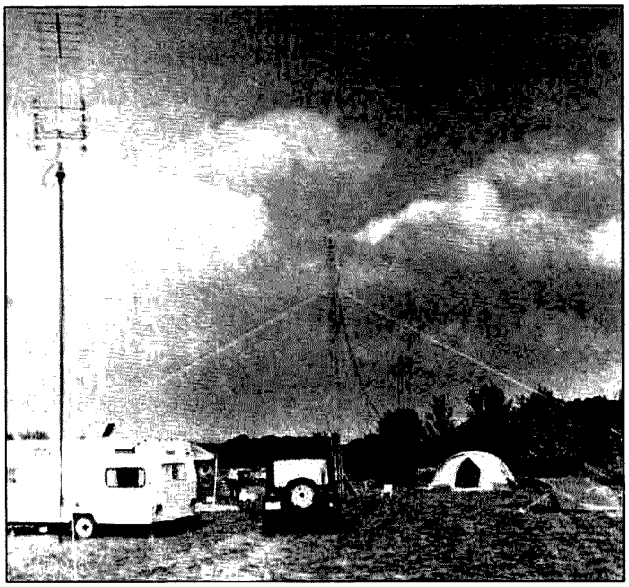


Photo B. Overview of last year's W8NP Field Day.

Use whatever comes from the junk box for antenna wire, but not magnet wire—it's too thin to guy the mast. With a hammer and nails, nail the two ripped 2-by-4 pieces together. Now, with the help of a friendly tree, raise the mast into place with the center insulator attached to the top. Tape the mast to the tree with the duct tape. Don't laugh, this has worked for years.

The antenna ends are now moved out into place and tied down as high as we can get them. The antenna wire becomes the guys for the mast. If you're still laughing, remember this thing has to stay up for only 24 hours. After Field Day is over, we pull down the whole mess, roll it up with the duct tape, and pitch it in the trash. The mast joins the Christmas yule log by the fireplace.

Some odds and ends. Bring along a crash kit of connectors, clip leads, a battery-powered soldering iron, a voltmeter (and test leads!), extra CW paddles, flashlights, food, diet Coke, rope for antennas, and, finally, bug spray.

Operating

Before the contest starts, connect the feedline to the antenna tuner and fire up the rig. Tune the antenna for all the bands you might work. Tape an index card on the transceiver with the station callsign and the tuner setting for each band. Listen around and make a few calls to see in which direction it works the best and the worst. If the antenna is weak toward the W3s, then don't waste time calling them when the contest gets rolling. Propagation does change from time to time, so keep checking those W3s.

I like to use the hunt-and-jump method, starting at the high end and working down, calling every station that I think will hear me. If I run out of new stations, I do a couple of CQs. In a contest like Field Day, I don't bother calling "QRL—frequency in use?" I listen a few seconds and run with it. If you wait too long, the frequency WILL be in use.

We keep a running log, but no dupe sheet because with QRP power, we average only 200–350 contacts per year. The computer can easily dupe that size log after everything is over. During the contest, I let the big stations dupe me and I save time and hassle.

Don't overlook the Novices; they are as eager for contacts as we are. Also, check out the lower ends of the bands for the slower CW ops. They are a gold mine of points too easily overlooked.

Whenever there's a lull, I check out the other bands without retuning the antenna. If the band is open, I can hear stations without the antenna matched. If things sound good, I'll tune the antenna to the band and start calling.

Ninety percent of our operating is CW. Steve likes to scream a bit now and then. We work SSB on 40 meters during the day because foreign night broadcast and contest QRM overpower our low-power station. Sometimes at night, 20-meter SSB has given us a few stations in the log; 75-meter phone has never been very good for us.

If you can stay awake all night, the big club stations will be yours for the picking, since you'll be the only new station on frequency and an extra 2 points for them. Don't forget to call CQ a bit at that time, because a lot of the club stations are listening for a new station.

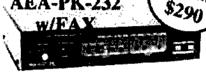
As in any contest, you have to decide either to have fun or win. Up to now, we've opted for having fun. In fact, in ten years of never missing Field Day, we have never gotten around to sending in a log. But maybe we'll change our minds and go for it one of these times, and if we do, watch out, because we can compete! This year, I'll be helping W8NP. Watch for us.

Finally

When the contest is all over, we clean up the site, pack up the gear, and make plans for next year.

Be careful at Field Day. Ham radio lost a member last year when an antenna wire connected to an overhead power line. At W8NP last year, Carl got hit in the face with an axe. (He's all fixed up and just as mean as ever.) We're out to have fun, not get killed.

Take some good photographs this year and send them to me. I'll print what I can in the QRP column. ■



LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
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HAS THE FCC GONE NUTS?

Guys and gals, have I got a deal for you. How would you each like your very own frequency on any band. That's right . . . you can own 146.52 MHz, or maybe you would prefer a 20-meter "channel" like 14.235 MHz.

How can this be? Simple. Just declare yourself to be a bona fide frequency coordinator and lay claim to anything you want! At least that's what our wonderous FCC seems to be saying now in their decision to backtrack on their decision to back a regional coordinator over a state coordinator or a state coordinator over a local one.

This is related to a Midwest inter-council dispute that I wrote about before. But now a new twist has been added by the commission, suddenly declaring that it's not within the legal purview of the FCC to determine who is and who is not a legal frequency coordinator. And, in essence, this latest action by the commission opens Pandora's box to every kook with an ego problem, at the expense of the rest of us. Let me digress.

Go over to your bookshelf and take out your March issue of *73*. Now, turn to page 72 where you will find the Looking West column subtitled "Pirate Coordination Vs. the FCC." In it, FCC Special Services Division Chief Raymond A. Kowalski states in part, "We are not going to put up with fly-by-night pirate coordinators!"

Now, keep this and one other thing in mind as you read the following. That is, the FCC cannot make or interpret their own rules to suit a given situation in one part of the country without directly having the same effect on similar situations elsewhere. More simply, federal regulations cannot be selective in their nature or application. Whether you live in Los Angeles, Chicago, Miami, or Bartlesville, Oklahoma, the same FCC rules and their interpretations apply.

A Lack of Backbone

Let's take it right from the top. Simply said, the FCC now says it does not have the legal authority to determine who is and who is not a legitimate amateur radio frequency coordinator. In a letter to a midwest council of amateur radio clubs, FCC Special Services Division Chief Raymond A. Kowalski dropped what may become a major bombshell in thwarting attempts by hams to obtain government recognition of the work of their voluntary repeater coordinators and councils.

"The rules do not provide for FCC determination of the legitimacy of each amateur frequency coordinator," [emphasis mine] wrote Kowalski. He continued: "We expect the parties to such disputes to behave honorably, taking account of the tradition of the amateur service and the potential exposure of uninvolved repeater owners and users to rules violations."

The foregoing letter from Kowalski was to the MOKAN Council of Amateur Radio Clubs. It came in answer to the MOKAN questioning of earlier correspondence from the Division Chief to former ARRL VHF Repeater Advisory Committee Chairman Joe Eisenberg WA0WRI.

It was the answer to Eisenberg's request for clarification of the rules regarding who is and who is not a valid coordinator that sparked a further escalation in the controversy between the MOKAN Council and the statewide coordinators of Kansas and Missouri. Neither the Kansas nor the Missouri state repeater councils recognize the MOKAN Council of Radio Clubs as the Kansas City coordinator even though MOKAN has been providing this service since the mid-1970s. That's long before either of the two statewide councils existed.

When the latter came into being, they decided to unilaterally oust the MOKAN-backed coordinator and replace him with one of their own choosing. Unfair? Probably so, but forgetting the moral rights and wrongs or fairness of what was taking place and judging only by what the FCC Special Services Division Chief said back a few months ago, the two statewide councils had every right to do as they pleased and were acting in direct accordance with the policy interpretation provided by the FCC.

But guess what? Presto-chango-positiono, as you have just read. But that was not all!

In his letter, Kowalski reiterated that as far as the commission was concerned, "it would rely upon state and regional (repeater) councils to recognize legitimate local coordinators." But he did not direct the Kansas or Missouri councils to recognize the MOKAN coordinator. Again, the situation was left hanging in midair.

> ***"Any one of you reading this column could unilaterally lay claim to being the single national frequency coordinator."***

Rather, Kowalski continued by restating a warning that repeater owners and users would be the ones held legally responsible for the inappropriate actions of feuding frequency coordinators: "Similarly, a regional or state council's refusal to recognize a local coordinator is prima facie evidence that that coordinator does not have the support of a majority of those eligible to establish repeaters in the area it claims to coordinate."

An Unrealistic Solution

The bureau chief also noted in his letter to the MOKAN Council of Radio Clubs something that he had stated in an FCC Forum at last September's ARRL National Convention in San Diego—that all of the hams of a given area had the right to select their own frequency coordinator:

"Other evidence that a frequency coordinator is recognized as such by local or regional amateur operators whose stations are eligible to engage in repeater or auxiliary operation (see Section 97.3 [aa] of the FCC rules) may be just as pertinent. The development of such evidence may be especially appropriate where the local coordinator believes that the regional or state council has acted on inaccurate or biased information. Whatever the process, it is the amateurs themselves who must pick their coordinator."

During his talk in San Diego, Kowalski suggested that elections might be held to determine who is and who is not the recognized frequency coordinator for a given locality.

At that time, not much thought was given to such a plan due to the overwhelming costs involved. However, this latest determination from the FCC may leave the amateurs of regions where there are inter-coordination or inter-coordinator disputes little option on the matter. That is, either spend several thousand dollars holding a properly supervised election to determine who is their coordinator or spend even thousands more in legal fees and court costs determining it there.

Coordinate With Whom?

Since the middle of last year, the commission has been advising that hams with repeaters coordinate them through bona fide and recognized frequency coordinators. They also said that in cases where one repeater is coordinated and the other is not, that it will become the responsibility of the uncoordinated repeater to totally eliminate any interference caused to the coordinated system.

But, with all of this, the commission now absolutely refuses to help us to determine who is and who is not a legal frequency coordinator. Rather, they offer solutions such as elections that are financially unrealistic for the amateur community.

In several geographic areas, there are already threats of litigation and court action between feuding coordinators and especially between new made-to-order coordinators and established councils. Suits between coordination bodies could be class action in nature, thereby involving an entire amateur community, whether or not they sponsor, support, or even operate through repeaters as users.

Unless the FCC is willing to change its determination and give legal recognition to those who have by virtue of longevity proven themselves to be valid

frequency coordination bodies, this issue will very likely soon wind up being solved at your expense at a ballot box or in a jury box with all of the cost coming from your pocket.

Two final questions were raised by Kowalski's letter to the MOKAN Council. One regards the new rash of so-called "made-to-order" coordinators and councils that have appeared to give pseudo-coordination to what existing councils consider "pirate repeaters." If, as Kowalski says, the FCC has no authority to determine who is and who is not a legitimate frequency coordinator, how can the commission pretend to enforce what he said earlier in his statement that "We are not going to put up with fly-by-night coordinators."

Right now, there appears to be no way to determine who is and who is not a legal frequency coordinator in the amateur radio service. And, for that matter, how can the FCC "continue to rely upon state and regional councils to recognize legitimate local coordinators" when the commission itself now says it does not possess the authority to recognize anyone?

This in turn leads me right back to the utterly absurd concept I started off with. That of anyone, anyplace, deciding that he or she is a bona fide amateur radio frequency coordinator. It's not so absurd after all, is it? The way things stand right now, any one of you reading this column could unilaterally lay claim to being the single "national frequency coordinator," and if you happen to have the bucks necessary to back your claim if challenged in court, you might just make it stick!

How does that old expression go? Oh yes. . . "That's another fine mess you've gotten us into, Ollie!" Something sobering to dwell on from those of us who write the late shift in Los Angeles.■

DX

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IARU REGION II CONFERENCE

The Radio Club of Argentina hosted delegates representing 24 amateur radio societies from North and South America at the IARU Region II Conference in October. (Members of IARU are national ham radio societies, such as the ARRL.) Conference recommendations ranged from standardizing right-hand circular polarization on 2.3 GHz EME to enlarging the DX window on 160 meters. Many of the decisions made at the conference concerned DX and DXing. Among the most notable of these were the following:

10-MHz Band

The conference voted to prohibit SSB from this band, at least until secondary status of amateur radio operators (in some countries) is changed. The conference also endorsed a proposal by the ARRL to prohibit contests and award credits on 10 MHz. The delegate from Montserrat (your editor, VP2ML) argued unsuccessfully against this prohibition, pointing out that many radio societies presently offer award credit for contacts on 10 MHz, and some even sponsor specific awards for the band, without causing undue interference to the fixed services that still have primary access to the band. Although the Region II Conference endorsed the League's proposal to ban such awards, the idea will probably not be accepted by IARU Regions I and III.

DXCC Cards

The conference asked the League's board of directors to investigate whether other IARU member societies could have the privilege of checking DXCC cards from amateurs in their countries. This would greatly reduce the risk of loss of these valuable cards. Whether the ARRL board or the DXCC desk will go along with this suggestion is another matter, of course, but perhaps the idea can be considered under the board-mandated study of DXCC.

Dates on QSL Cards

One of the most lengthy debates at the conference was over the recommended form of the date on QSLs. Experienced DXers recognize the confusion caused by the U.S. system of dates (month, day, year), while the rest of the world primarily uses day, month, year. In anticipation of greater use of computers to produce and handle QSLs, and in accordance with the SSI (metric) system, the conference agreed that dates on QSLs should be in the form of YY/MM/DD, with two-digit numbers used for each portion of the date. Thus, October 26, 1986 would be written 86/10/26.

> ***"Conference recommendations ranged from standardizing right-hand circular polarization on 2.3 GHz EME to enlarging the DX window on 160 meters."***

Portable Callsigns

Another controversial decision concerned the form of portable callsigns when you're operating from another country. The conference finally agreed, after a lengthy debate, to go along with ITU regulations, which specify that the country of portable operation should be given first, followed by the home call: VP2M/WB2CHO.

The ARRL has already acted on this recommendation. The League asked the Federal Communications Commission to change the amateur rules for portable callsigns to put the country first: W2/VP2ML. The holdup has been the exact wording of our paperless reciprocal privileges with Canada. U.S. and Canadian amateurs can operate in each others' countries without any paperwork; they simply add the portable country designator: WB2CHO/VE7.

The International Amateur Radio Union was founded in Paris in 1925 to provide support and coordination to national amateur radio societies, such as the ARRL. The IARU was the organization that won the new bands at the 1979 World Administrative Radio Conference. And the IARU is already preparing for the *next* WARC, some time in the 1990s. More than 100 national societies belong to the IARU.

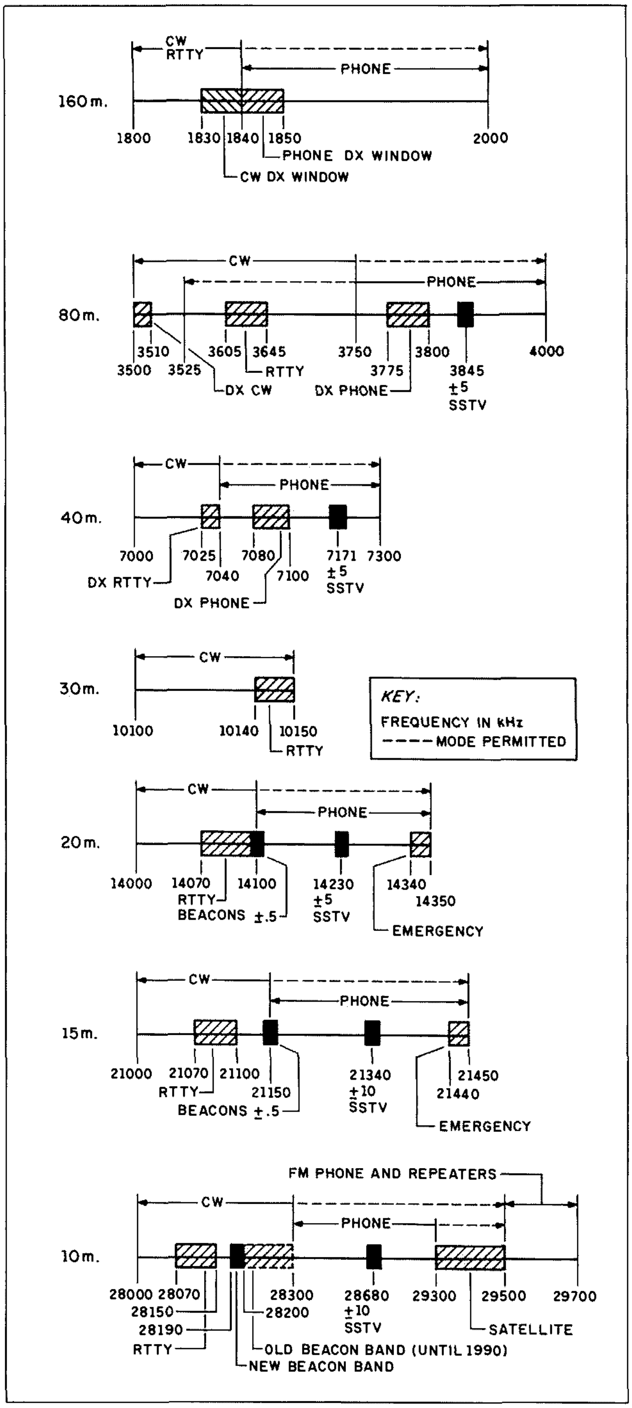

Fig. 1. The IARU Region II recommended HF band plans from the IARU Region II Conference (Buenos Aires, Argentina, October, 1986).

Photo A. VP2ML/LU at the club station of the Radio Club of Argentina during the IARU Region II Conference in October.

Photo B. The delegations from Montserrat and the United States (EE UU) at the IARU Region II Conference in Buenos Aires. The headphones are for simultaneous translations between English and Spanish.

The Canadians have said they won't go after hams using the IARU-recommended system: VE7/WB2CHO. So even though this callsign form is technically against the reciprocal rules, amateurs will be able to comply with the IARU recommendation in the near future.

Ten-Meter Beacons

The conference recognized the value and efficiency of the Northern California DX Foundation's system of 20-meter beacons, and recommended a similar system be established on 10 meters by 1990. Beacons would operate on frequencies between 28.190 and 28.200 MHz, freeing the present 28.200–28.300 segment for normal contacts.

Band Plans

DXers will be pleased to hear that the very first items considered in recommending HF band plans for Region II were the DX windows! (Could the influence of the delegate from Montserrat have had anything to do with this priority?) On 160 meters, the IARU Region II band plan has CW and RTTY below 1.840 MHz, and phone above 1.840; 1.830–1.840 is the designated CW DX window, and 1.840–1.850 the SSB DX window. These segments should be reserved for intercontinental QSOs.

On 80 meters, 3.500–3.510 MHz is the CW DX window, while 3.775–3.800 is the SSB DX window. DX windows for 40 meters include 7.035–7.040 MHz for RTTY and 7.080–7.100 for SSB. Other details of the recommended band plans are shown in Fig. 1.

Other Matters

The new format of the IARU HF Championship (formerly Radiosport) was endorsed. Member societies were encouraged to activate their own headquarters stations as additional multipliers. June 17 was selected as World QRP Day.

The Amateur Code was endorsed (see any edition of the ARRL *Handbook*). A worldwide HF packet network was endorsed in principle, although packet operation is considered to be third-party traffic in many countries, and is therefore banned in those countries. Certain RTTY and ASCII formats were endorsed as standards.

The problem of RFI-susceptibility of other electronic equipment (such as microwave ovens, electronic organs, and furnace controls) was discussed, with particular reference to the case of VE3SR. The conference endorsed the concept that the manufacturers of such equipment (not the ham) should be responsible for RFI-proofing their products.

And the conference urged the expansion of the 160-meter band above 1.850 in southern South America, and the expansion of the 80-meter band above 3.750 in the same region. The delegate from Montserrat made absolutely sure that the conference did NOT endorse the position of Region III, that "recognized the problems caused by DX and DXpeditions."

None of the decisions made at the Buenos Aires conference carry the force of law, nor can an individual member society be compelled to go along with the conference recommendations. However, many societies will use these ideas as the basis of their presentations to their telecommunications authorities. Thus, many of these suggestions will find their way into regulation and general use in the future, as with the proposal on portable callsign format.

Special thanks to the Argentine Radio Club for a super job as host society. ■

FUN!

John Edwards KI2U
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Middle Village NY 11379

QRM—THE NEWSLETTER

A few issues back I told you about the Uncle Floyd Radio Club (WA2DCS), perhaps the only ham club to be officially defrocked by the ARRL. I also told you about *QRM*, the newsletter that caused said defrocking.

Since then, a number of readers have written in to ask what on earth could have made the League so angry. Could mere printed words alone have driven the League's officials to so harsh an action? "Tell us more, please; tell us more," enquiring minds begged.

Well, I don't have room to print the entire newsletter here. But, in the best tradition of *USA Today* and *Readers' Digest*, I can provide you with some highlights from the Fall, 1980, *QRM* issue, the very edition that caused the ARRL to throw KI2U out of the hallowed gates of 225 Main Street. Ouch.

QRM—Devoted Entirely to Itself

The official bulletin of the Uncle Floyd Radio Club, WA2DCS-WR2APG:

The UFRC Amateur's Code

The Amateur is Gentlemanly. . . He never purposely interrupts a QSO unless the situation is vital—as in the case of needing a new country.

The Amateur is Loyal. . . Like a lemming, he will follow the lead of the American Radio Relay League, no matter how stupid or dangerous the course.

The Amateur is Progressive. . . He progresses from rig to rig as manufacturers introduce increasingly fancier, higher-priced models.

The Amateur is Friendly. . . Be his coax cut, his repeater jammed, or his subscription to *QST* screwed up, the Amateur always maintains a happy countenance.

"The Amateur is Gentlemanly. . . He never purposely interrupts a QSO unless the situation is vital—as in the case of needing a new country."

The Amateur is Balanced. . . Or his SSB signal will sound funny.

The Amateur is Patriotic. . . His knowledge and his station are always ready for the service of his country and his community—even if he lives in Moscow, USSR.

—**Hiram Percy Sanka**

UFRC Safety Code

1. Power circuits completely before touching behind the panel or inside the chassis or the enclosure.
2. Ask a brain-damaged friend to switch power on and off for you while you're working on the equipment.
3. Always troubleshoot a transmitter when tired, sleepy, or under the influence of drugs or alcohol.
4. Use non-insulated screwdrivers or even your fingers to do any work in the final cage of a transmitter.
5. While you're swimming or bathing is always a good time to do repair work on high-voltage electronic equipment.
6. Soothing music sent through headphones can make hours pass quickly while you're working on gear.
7. Follow the rule of keeping one hand in a friend's pocket.
8. Instruct members of your household how to notify *QST* so that you can be listed as a "Silent Key."
9. Take time to be careless. DEATH IS PERMANENT!

Results: 1980 CW Joke Contest

There were a record-breaking number of participants this year. The winner this year was none other than JY1. While we can't reprint his winning joke here, the punch line was "and that's what she said last night!"

The three runner-up punch lines were:

"Because he could get stuck in a bottle."

"And erecting an antenna can be fun, too!"

"I think your sign fell down."

I Would Like To Get In Touch With. . .

Any ham who can tell me how to convert my HW-8 to SSB. I have just received my General ticket and am anxious to get on SSB. John Q. Amateur KA8XYZ/TL, 123 Main Street, West Underarm OH 87656.

Novices under 10 to form a traffic net. Neill "Rusty" Hitt KAØZTT, 87 Central Avenue, East Armpitt NE 98765.

Any good-looking YL, 20 or younger. Must be rich, easy, and own a nice car. Please contact John Edwards WB2IBE.

UFRC Announcements

Flash! The Federal Communications Commission just announced a proposal to channelize the 20-meter band. Also, a power limit of 5 Watts input has been proposed. This proposal is likely to go into effect sometime next year.

THE UFRC SSTV beauty contest will be held during the last weekend of October 1980. An award will be given to the best-looking ham on SSTV. All applicants will be judged by their appearance on SSTV. There will be awards in three categories: YL, OM, and Novice.

The "What the Uncle Floyd Radio Club Means To Me" contest is on once again. All entrants must state what the UFRC means to them in 73 words or less. The judges will be looking for the most sincere and convincing entry.

That's It

So there you have it—minus illustrations and some stuff I couldn't possibly run in a family-oriented magazine—the UFRC's infamous *QRM* newsletter.

Incidentally, if your club is looking to get booted out of the League, I do operate a ham club newsletter consulting service. Drop me a line for details.■

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

```
Receiver  -----------------------------------------+
 Audio    ---------+                               |  Diodes are
                   |                               |  1N914 or
                   *---------|>|-------------------*  Similar
                   |                               |
                   *---------|<|-------------------*
                   |                               |
                   |                               +------ To CoCo
                   +-------------------------------------- Input
```

Fig. 1. A simple limiter.

RTTY.BIN

Wait a minute, let me double-check the cover. Yep, this is the June, 1987, issue of *73*. That means we are starting the eleventh year of RTTY Loop with this issue. All I can say is "Thanks!" Thanks to each and every one of you who has been following this column these years and whose letters and calls have made this column the popular *73* feature it is.

One of the patterns I set a few years ago was to highlight a computer program in the June or July issue. With the proliferation of commercial programs for many systems and dedicated hardware, many of you expressed an interest in seeing more of these items. However, interest in software solutions to getting on RTTY remains, and with the help of some of our friends, some creative solutions can yet be found.

In the world of the TRS-80 Color Computer, be it the CoCo 1, the CoCo 2, or the new CoCo 3, the name of Marty Goodman, M.D., certainly stands out. Marty has been an outspoken advocate of the CoCo and has been responsible for many fine programs that reached the users of this machine.

In the November, 1986, issue of *Rainbow* Magazine, Marty presented a RTTY program for the CoCo that possessed many of the features often asked for in wish lists. I asked Marty for permission to run the program here, for the benefit of the readers of this column, and he has graciously agreed.

Let me tell you a little about this program, and get to the listings, which are going to be hard to hide, later. The program, RTTY.BIN,

```
 NAM  RTTY
* RTTY.BIN by N6LQV
 ORG  $40
* KEYBOARD SCAN VARIABLES           *
COLMSK RMB  1       COLUMN MASK
COLCNT RMB  1       COLUMN NUMBER
ROWCNT RMB  1       ROW COUNT
ROWMSK RMB  1       ROW MASK
* TRANSMIT BUFFER VARIABLES         *
TXIN   RMB  2       INPUT PTR.
TXOUT  RMB  2       OUTPUT PTR.
TXECHO RMB  2       ECHO PTR.
TXSHFT RMB  1       SHIFT FLAG
* TRANSMIT ECHO VARIABLES           *
ESCROL RMB  1       SCROLL FLAG
ECURS  RMB  2       CURSOR PTR.
ESHFT  RMB  2       TABLE PTR.
* TRANSMIT MODULATOR VARIABLES *
HFDLY  RMB  1       TONE DELAY
LFDLY  RMB  2       BIT DELAY
TXFLAG RMB  1       TRANSMIT FLAG
* RECEIVE DEMOD. VARIABLES          *
CCOUNT RMB  1       CYCLE COUNTER
TONE   RMB  1       RECEIVE FREQ.
BITAVG RMB  1       BIT AVERAGE
CNTAVG RMB  1       # OF SAMPLES
OLDIND RMB  1       TUNING METER
* RECEIVE/TRANSMIT VARIABLES        *
BITTIM RMB  2       BIT TIME
BITCNT RMB  1       BIT COUNTER
SHIFT  RMB  1       SHIFT REG
* RECEIVE PRINT VARIABLES           *
RXCURS RMB  2       CURSOR PTR.
RXSHFT RMB  2       TABLE POINTER
* TRANSMIT DELAY TIMES ALL IN       *
* 5 CYCLE INCREMENTS                *
D2125  EQU  42      MARK TONE DLY
D2295  EQU  39      SPACE TONE DLY
DDATA  EQU  3937    DATA BIT TIME
DSTOP  EQU  5548    STOP BIT TIME
* RECEIVE CONSTANTS TIMES ARE       *
* IN 15 CYCLE INCREMENTS            *
RTHRES EQU  82      RX THRESHOLD
RBIT   EQU  1312    RX BIT TIME
STBIT  EQU  RBIT/2  STOP WAIT.
TIMOUT EQU  96      INPUT TIMEOUT
* CURSOR COLOR CONSTANTS            *
TCOLOR EQU  $BF     TRANSMIT COLOR
RCOLOR EQU  $9F     RECEIVE COLOR
 ORG  $E00
START  LDD  #$343C
 STB  $FF01       SOUND FROM
 STA  $FF03       RADIO.
 STA  $FF21       TX OFF.
 STB  $FF23       SOUND ON.
 ORCC #$50
 CLR  ROWCNT      RESET
 LDD  #$FEF8      KEYBOARD.
 STD  COLMSK
 LDX  #TXBUF      RESET TX
 STD  TXIN        BUFFER &
 STD  TXOUT       SHIFT.
 STD  TXECHO
 CLR  TXSHFT      RESET RX,
 CLR  ESCROL      TX & ECHO
 LDX  #LTRS       BAUDOT
 STX  ESHFT       SHIFT
 STX  RXSHFT      FLAGS.
 CLR  TXFLAG      RX MODE.
 CLR  OLDIND      RX METER.
 LDX  #$400
 LDU  #LABBLR
A0     LDA  ,U+         PRINT
 STA  ,X+
 CMPX #$420
 BLO  A0
 LDD  #$6060      CLEAR
B0     STD  ,X++        SCREEN.
 CMPX #$600
 BLO  B0
 LDX  #$5E0       SET RX &
 STX  ECURS       TX ECHO
 LDA  #TCOLOR     CURSORS.
 STA  ,X
 LDX  #$5A0
 STX  RXCURS
 LDA  #RCOLOR
 STA  ,X
MAIN   BSR  RXCHAR
 BSR  RXSCR
 BRA  MAIN
RXSCR  LDX  RXSHFT  CONVERT
 LDA  A,X       CHARACTER.
 BMI  RXCON     CONTROL?
 CMPA #$60
 BNE  A0
 BSR  RXLTR
A0     LDX  RXCURS  PUT CHAR AT
 STA  ,X+       CURSOR.
 CMPX #$5C0     DO CR IF AT
 BLO  CURSON    LINE END.
RXCR   LDX  #$420    SCROLL
A0     LDD  32,X     SCREEN UP
 STD  ,X++      ONE LINE.
 CMPX #$5A0
 BLO  A0
 LDD  #$6060  BLANK LAST
B0     STD  ,X++     LINE OF
 CMPX #$5C0    SCREEN.
 BLO  B0
 LDX  #$5A0    SET CURSOR.
CURSON STX  RXCURS
 LDA  #RCOLOR PUT NEW
 STA  ,X       CURSOR IN.
 RTS
RXCON  INCA
 BNE  A0       $FF=CR.
 LDA  #$60
 STA  [RXCURS]
 BRA  RXCR
A0     INCA
 BNE  B0       $FE=FIGS.
 LDX  #FIGS    FIGURES
 BRA  C0       SHIFT.
B0     INCA
 BNE  D0       $FD=LTRS.
RXLTR  LDX  #LTRS    LETTERS
C0     STX  RXSHFT  SHIFT.
D0     RTS
* RECEIVE START BIT *
RXCHAR LDA  TXFLAG
 BEQ  A0
 LBSR DOTX
A0     CLR  BITTIM      RESET
 CLR  BITTIM+1    TIME.
 CLR  BITAVG
A0     LDB  #19       2
 BSR  TIMCYC 220 SAMPLE
 LDD  TONE     5 INPUT.
 CMPA #RTHRES 2
 BCS  B0       3 INTEGRATE
 BRN  *        3 INPUT AND
 DECB          2 RESET
 BPL  D0       3 TIMER IF
 BRA  RXCHAR     MARKING.
B0     INCB          2
 BMI  C0       3
 BRA  D0       3
C0     LDD  #$7F     3
D0     STB  BITAVG   4
 CLRA          2 ADD TIME
 LDB  TONE     4 AND SEE
 ADDD BITTIM   6 IF ENTIRE
 STD  BITTIM   5 BIT TIME
 SUBD #RBIT    4 (START
 BCC  E0       3 BIT) YET.
 CMPX 1,X      7 DELAY.
 CMPX 1,X      7
 BRA  A0       3
E0     STD  BITTIM
 LDA  #5          SET BIT
 STA  BITCNT      COUNTER.
* RECEIVE FIVE DATA BITS *
RXBITS LDD  #19      3
 STA  BITAVG  4 CLR COUNT
 STA  CNTAVG  4 & AVERG.
A0     BSR  TIMCYC 220 SAMPLE
 CLRA          2 INPUT.
 LDB  TONE     4
 ADDD BITTIM   6 IS THIS
 STD  BITTIM   5 BIT TIME
 SUBD #RBIT    4 UP YET?
 BCC  B0       3
 LDD  TONE     5
 CMPA #RTHRES 2 AVERAGE
 ADCB #0       2 INPUT
 STB  BITAVG   4 SAMPLES.
 INC  CNTAVG   6
 NOP           2 DELAY.
 LDB  #18      2 TIME USED
 BRA  A0       3 SO FAR.
B0     STD  BITTIM  5
 LDB  BITAVG   4 EXTRACT
 ASLB          2 BIT FROM
 CMPB CNTAVG   4 AVERAGE.
 ROR  SHIFT    6
 DEC  BITCNT   6
 BNE  RXBITS   3
A0     CMPX [,X]     9 DELAY.
 LDB  #8       2 IGNORE
 BSR  TIMCYC 220 SOME OF
 CLRA          2 STOP BIT
 LDB  TONE     4 INCASE OF
 ADDD BITTIM   6 TIMING
 STD  BITTIM   5 ERROR IN
 SUBD #STBIT   4 SIGNAL.
 BCS  A0       3
 LDA  SHIFT
 LSRA             POSITION
 LSRA             CHARACTER
 LSRA             IN BYTE.
 RTS
* SAMPLE 3 CYCLES OF INPUT.    *
* B=STARTING TIME.
TIMCYC BSR  TIMIN  14 SYNC WITH
 CLRA          2 SIGNAL.
 ADDD BITTIM   6 ADD UP
 STD  BITTIM   5 TIME USED.
 LDD  #2       3
 BSR  TIMIN  14 SAMPLE 1.
 ADDB #2       2 ADD TIME.
 BSR  TIMIND 28 SAMPLE 2.
 ADDB #2       2 ADD TIME.
 BSR  TIMIND 28 SAMPLE 3.
 STB  TONE     4
 SUBB #89      2 ADJUST
 NEGB          2 FREQ. TO
 BMI  A0       3 0-15 FOR
 BRA  B0       3 TUNING
A0     LDD  #0       3 METER.
B0     CMPB #15      2
 BHI  C0       3
 BRA  D0       3
C0     LDD  #15      3
D0     CMPB OLDIND  4 UPDATE
 BNE  E0       3 METER?
 MUL          11
 MUL          11 DELAY.
 CMPX D,X     10
 BRA  F0       3
E0     LDX  #$410    3
 LDA  B,X      5 SET NEW
 ANDA #$BF     2 POINTER.
 STA  B,X      5
 LDA  OLDIND   4
 STB  OLDIND   4
 LDB  A,X      5 CLEAR OLD
 ORB  #$40     2 POINTER.
 STB  A,X      5
F0     LBSR CHKKEY 130
 RTS           5
* THIS TAKES 220 CYC. WITH BSR.*
* TIME INPUT: B=STARTING TIME. *
TIMIND CMPX 1,X      7 DELAY.
 CMPX 1,X      7
TIMIN  LDA  #1       2 INPUT BIT.
A0     INCB          2
 CMPB #TIMOUT 2 TIMEOUT?
 BLO  B0       3
 CMPA 1,X      5 DELAY.
 BRA  C0       3
B0     BITA $FF20    5 AWAIT
 BEQ  A0       3 INPUT=1.
C0     INCB          2
 CMPB #TIMOUT 2 TIMEOUT?
 BLO  D0       3
 CMPA 1,X      5 DELAY.
 BRA  E0       3
D0     BITA $FF20    5 AWAIT
 BNE  C0       3 INPUT=0.
E0     RTS           5
* THIS USES 14 CYC. WITH BSR.  *
* B=TIME IN 15 CYCLE STEPS.    *
* TRANSMIT DATA IN BUFFER.     *
DOTX   LDX  #$405  SHOW TRANSMIT
 LDU  #LABELT MESSAGE.
A0     LDA  ,U+
 STA  ,X+
 CMPX #$40D
 BLO  A0
 LDD  #$343C ENABLE SOUND
 STB  $FF21  OUTPUT AND
 STA  $FF01  TRANSMITTER.
 LDA  #2     SET DAC FOR
 STA  $FF20  LOUDEST SOUND
 CLR  BITTIM
 CLR  BITTIM+1
TXCLOP LDX  TXOUT   5 ANY CHAR'S
 CMPX TXIN     6 IN BUFFER?
 BEQ  DOSTOP  3
 LDD  #DDATA  3 SET DATA
 STD  LFDLY   5 BIT DELAY.
 LDA  #5      2 SET COUNT.
 STA  BITCNT  4
 LDB  ,X+     6 SET CHAR.
 STX  TXOUT   5
 STB  SHIFT   4
 CLRB         2 SEND START
 BSR  TXBIT  93 BIT (0).
 CMPX [,X]    9 DELAY.
A0     LDD  #B      3 DELAY.
B0     DECB         2
 BNE  B0      3
 LSR  SHIFT   6 SEND NEXT
 BSR  TXBIT  93 DATA BIT.
 DEC  BITCNT  6 DONE CHAR?
 BNE  A0      3
 LDD  [D,X]  12 DELAY.
DOSTOP MUL         11 DELAY.
 CMPX D,X    10
 LDD  #DSTOP  3 SET STOP
 STD  LFDLY   5 BIT DELAY.
 COMB         2 SEND STOP
 BSR  TXBIT  93 BIT (1).
 LDA  TXFLAG  4 END IF TX
 BNE  TXCLOP  3 FLAG=0.
ENDTX  LDD  #$343C MOTOR RELAY
 STA  $FF21  OFF, SOUND
 STB  $FF01  FROM RADIO.
 LDX  #$405
 LDU  #LABELR+5
A0     LDA  ,U+     SHOW RECEIVE
 STA  ,X+    MESSAGE.
 CMPX #$40D
 BLO  A0
 RTS
SMARK  LDA  $FF20   5 SET RS-232
 ORA  #2      2 OUT = -12V
 STA  $FF20   5
 LDA  #D2125  2 HF=2125 HZ
 STA  HFDLY   4
 RTS          5
* THIS TAKES 30 CYC. WITH BSR. *
SSPACE LDA  $FF20   5 SET RS-232
```

Program listing 1. RTTY.BIN source listing.

will run on any CoCo with 16K of memory or more. A disk is not required, and this simple program does not make use of disk buffers or such. This is an "interfaceless" program. That means that receiver audio is fed directly into the CoCo using the plug that normally would go into the "EAR" jack on the cassette recorder (the black plug), and it sends AFSK via the cassette record output (the gray plug).

As far as hardware goes, you may have to add a stage of external limiting to the input; try a pair of 1N914s across the receiver output back to back. Fig. 1 is a simple way of doing this. Similarly, the output of the CoCo may exceed the mike gain of your transmitter. A resistive attenuator may be required in that instance. Play with it. You shouldn't hurt anything. One thing, though: I am not clear on the "spectral purity" of the CoCo output. I, for one, would limit this version of AFSK to VHF, where the spurious signals produced by a less-than-perfect sine wave fed into a sideband transmitter would not be a problem.

The cassette relay is used to switch the system from transmit to receive. If there is not too much voltage on your PTT line, and with most VHF rigs there shouldn't be, you could switch the PTT line directly with the relay.

After loading and EXECing the program, you should be greeted with a clear screen, a tuning meter in the upper right corner, a yellow cursor near the bottom which will generate received text, and a red cursor for transmitted text. Tune the RTTY signal being received so the black tuning cursor flips back and forth, left and right, in step with the received signal. The CLEAR key toggles from transmit to receive, and back again. You can type ahead while in receive mode; what you type is placed in a buffer to be transmitted when you change modes. If you want to dump the transmit buffer before sending it, use the BREAK key. The last thing to mention is the bell, which is both displayed and sent as an up arrow.

Program listing 1 is the full source for RTTY.BIN, written using the Macro-80C editor assembler. While some of you might be adventurous enough to type it in, those with nimble fingers may prefer the version in Program listing 2. This is a Basic loader which will create RTTY.BIN on disk from the embedded DATA statements. Cassette users need only change the SAVEM statement to an appropriate CSAVEM statement and save the program to tape.

Now, for those who really can't bring themselves to type all of this in, there are several options. A machine-readable version, "Rainbow on Tape" or "Rainbow on Disk," is available for $10 for tape and $12 for disk from *Rainbow* at PO Box 385, Prospect KY 40059. Alternatively, subscribers to Delphi will find the complete source and binary file in the CoCo SIG on that network. Just type GROUP COCO, go to the DATA-

```
 ANDA #$FD     2 OUT = +12V
 STA  $FF20    5
 LDA  #D2295   2 HF=2295 HZ
 STA  HFDLY    4
 RTS           5
* THIS TAKES 30 CYC. WITH BSR. *
* CARRY=BIT TO SEND.            *
TXBIT  BCC  A@      3 DECIDE.
 BSR  SMARK   30 MARK (1).
 BRA  B@       3
A@     BSR  SSPACE 30 SPACE (0).
 BRA  B@       3
B@     SUBA #29      2 ADJUST.
* THIS TAKES 93 CYC. WITH BSR. *
* TIME IS ADJUSTED ASSUMING     *
* 52 CYC. USED BETWEEN BSR'S.   *
TONES  DECA         A*5 DELAY ONE
 BNE  TONES       HALF CYC.
 LDA  $FF20    5 TOGGLE
 EORA #$FC     2 OUTPUT.
 STA  $FF20    5
 LDB  HFDLY    4 ADD TIME
 CLRA          2 USED SO
 ADDD BITTIM   6 FAR.
 STD  BITTIM   5 EXIT IF
 SUBD LFDLY    6 TIME FOR
 BCC  A@       3 NEXT BIT.
 BSR  CHKCOL 128 SCAN KBD.
 LDA  HFDLY    4 GET DELAY,
 SUBA #35      2 SUBTRACT
 BRA  TONES    3 TIME USED.
A@     STD  BITTIM  5 SAVE EXTRA
 RTS           5 TIME USED.
* THIS TAKES 55 CYC. WITH BSR. *
KEYDLY CMPX [,X]     9 DELAY.
KDLY1  MUL           11
 CMPX 1,X      7
 RTS           5
* CHECK KEY COLUMN. THIS TAKES *
* 128 CYCLES INCLUDING BSR.     *
CHKCOL LDA  ROWCNT  4 GO IF ROW
 BNE  CHKROW   3 NOT DONE.
 LDD  COLMSK   5 A=COLUMN
 SUBB #55      2   MASK.
 ROLA          2 B=COLUMN
 ORA  #1       2   NUMBER.
 BCC  A@       3 DO ALL 8
 BRA  B@       3 COLUMNS &
A@     LDD  #$FEF8  3 REPEAT.
B@     STD  COLMSK  5
 LDX  #$152    3 POINT AT
 ABX           3 MIRROR.
 STA  $FF02    5 READ ONE
 LDA  $FF00    5 COLUMN.
 ORA  #$80     2 COMPARE
 TFR  A,B      6 COLUMN &
 EORB ,X       4 MIRROR.
 ANDB ,X       4 B=NEW KEY
 BRN  *        3   MASK.
SETROW STA  ,X       4
 LDA  #7       2 A=ROW
 STD  ROWCNT   5   COUNT.
 LDX  TXIN     5 CHECK IF
 CMPX TXOUT    6 TRANSMIT
 BNE  KEYDLY   3 BUFFER
 CMPX TXECHO   6 IS EMPTY.
 BNE  KDLYI    3
 LDX  #TXBUF   3 RESET
 STX  TXOUT    5 BUFFER
 STX  TXECHO   5 POINTERS.
 STX  TXIN     5
 RTS           5
* CHECK KEYBOARD. THIS TAKES   *
* 128 CYCLES INCLUDING BSR.     *
CHKKEY LDA  ROWCNT  4 GO IF ROW
 BNE  CHKROW   3 NOT DONE.
 LDD  COLMSK   5 A=COLUMN
 SUBB #55      2   MASK.
 ROLA          2 B=COLUMN
 ORA  #1       2   NUMBER.
 BCC  A@       3 DO ALL 8
 BRA  B@       3 COLUMNS &
A@     LDD  #$FEF8  3 REPEAT.
B@     STD  COLMSK  5
 LDX  #$152    3 POINT AT
 ABX           3 MIRROR.
 STA  $FF02    5 READ ONE
 LDA  $FF00    5 COLUMN.
 ORA  #$80     2 COMPARE
 TFR  A,B      6 COLUMN &
 EORB ,X       4 MIRROR.
 ANDB ,X       4 B=NEW KEY
 BNE  SETROW   3   MASK.
 STA  ,X       4
 LDA  COLCNT   4 STEP TO
 INCA          2
 BEQ  C@       3
 ADDA #55      2 NEXT KEY
 STA  COLCNT   4 COLUMN.
 BRN  *        3 DELAY.
 BRA  KEYDLY   3
C@     LDA  #7       2
 STD  ROWCNT   5
 LBRA KEYDLY   5
CHKROW DECA          2 ONE MORE
 STA  ROWCNT   4 ROW DONE.
 LDB  COLCNT   4 ADVANCE
 ADDB #8       2 COUNT TO
 STB  COLCNT   4 NEXT ROW.
 LSR  ROWMSK   6 TEST NEXT
 BCC  TXSCR    3 KEY BIT.
* B=KEY NUMBER 0-55.
 LDA  #$7F     2 CHECK
 STA  $FF02    5 SHIFT KEY.
 LDA  $FF00    5
 ANDA #$40     2
 BEQ  A@       3
 LDX  #TXTAB   3 UNSHIFTED
 BRA  B@       3 TABLE.
A@     LDX  #TXTAB1 3 SHIFTED
 BRA  B@       3 TABLE.
B@     LDA  B,X      5 GET BAUDOT
 LDB  B,X      5 CODE.
 BMI  TXCON    3 CONTROL?
 LDX  TXIN     5
 EORA TXSHFT   4 CHECK IF
 STB  TXSHFT   4 SHIFT IS
 ANDA #$60     2 NEEDED.
 BNE  DOSHFT   3
 ANDB #$1F     2 PUT CHAR.
 STB  ,X+      6 IN BUFFER.
 MUL          11
 BRN  *        3
 BRA  ENDPUT   3
DOSHFT BITB #$40     2 WHAT SHIFT
 BNE  A@       3 NEEDED?
 LDA  #$1B     2 FIGURES
 BRA  B@       3 SHIFT.
A@     LDA  #$1F     2 LETTERS
 BRA  B@       3 SHIFT.
B@     ANDB #$1F     2 PUT SHIFT
 STD  ,X++     8 & CHAR IN
 CMPA 1,X      5 DELAY.
ENDPUT STX  TXIN     5 BUFFER.
 RTS           5
TXCON  LDX  TXIN     5
 INCB          2 $FF=SPACE.
 BNE  A@       3
 LDA  TXSHFT   4 UNSHIFT
 ANDA #$40     2 ON SPACE.
 STA  TXSHFT   4
 LDD  #4       3 PUT SPACE
 STB  ,X+      6 IN BUFFER.
 MUL          11 DELAY.
 BRA  ENDPUT   3
A@     INCB          2 $FE=ENTER.
 BNE  B@       3
 LDD  #$0802   3 PUT
 STA  ,X+      6 CR,CR,LF
 STD  ,X++     8 IN BUFFER.
 CMPA D,X      8 DELAY.
 BRA  ENDPUT   3
B@     INCB          2 $FD=CLEAR.
 BNE  C@       3
 COM  TXFLAG   6 TOGGLE
 BRA  E@       3 TRANSMIT.
C@     INCB          2 $FC=BREAK.
 BEQ  BREAK    3
 CMPA ,X       4 DELAY.
E@     MUL          11
 CMPA D,X      8
 RTS           5
TXSCR  LDB  ESCROL  4 SCROLLING
 BEQ  ECHAR    3 NEEDED?
 SUBB #4       2 FOUR BYTES
 STB  ESCROL   4 MOVED.
 LDX  #$5E0    3 POINT AT
 ABX           3 BYTES.
 LDD  ,X       5 MOVE TWO
 STD  -32,X    6 BYTES.
 LDD  #$6060   3 BLANK OUT
 STD  ,X++     8 OLD BYTES.
 LDD  ,X       5 REPEAT
 STD  -32,X    6 AGAIN.
 LDD  #$6060   3
 STD  ,X       5
 LDB  ESCROL   4 SCROLLING
 BEQ  A@       3 DONE?
 MUL          11 DELAY.
 CMPX ,X       6
 RTS           5
A@     LDX  #$5E0    3 RESET
 STX  ECURS    5 CURSOR TO
 LDA  #TCOLOR  2 START OF
 STA  ,X       4 LAST LINE.
 BRN  *        3 DELAY.
 RTS           5
BREAK  LDA  #$60     2 TURN OFF
 STA  [ECURS]  9 CURSOR,
 STX  TXOUT    5 EMPTY TX
 LDD  #32      3 BUFFER &
 STB  ESCROL   4 DO CR.
 RTS           5
ECHAR  LDX  TXECHO  5 ANYTHING
 CMPX TXIN     6 TO BE
 BNE  B@       3 ECHOED?
 LDD  #12      3 DELAY.
A@     DECB          2
 BNE  A@       3
 RTS           5
B@     LDA  ,X+      6 GET CHAR.
 STX  TXECHO   5
 LDX  ESHFT    5 CONVERT
 LDA  A,X      5 CHAR.
 BMI  ECON     3 CONTROL?
 LDX  ECURS    5 PUT AT
 STA  ,X+      6 CURSOR.
 CMPX #$600    4 DO CR IF
 BHS  ECR      3 LINE END.
 STX  ECURS    5
 LDA  #TCOLOR  2 PUT NEW
 STA  ,X       4 CURSOR IN.
 CMPX D,X     10 DELAY.
 RTS           5
ECON   INCA          2 $FF=CR.
 BNE  CHKLTR   3
 NOP           2 DELAY.
 LDA  #$60     2 CLEAR OLD
 STA  [ECURS]  9 CURSOR.
ECR    LDA  #32      2 SET SCROLL
 STA  ESCROL   4 FLAG.
 MUL          11 DELAY.
 LEAX 0,X      4
 RTS           5
CHKLTR INCA          2 $FE=FIGS.
 BNE  A@       3
 LDX  #FIGS    3 FIGURES
 STX  ESHFT    5 SHIFT.
 CMPA 1,X      5 DELAY.
 BRA  C@       3
A@     INCA          2 $FD=LTRS.
 BNE  B@       3
 LDX  #LTRS    3 LETTERS
 STX  ESHFT    5 SHIFT.
 BRA  C@       3
B@     MUL          11 DELAY.
C@     MUL          11
 NOP           2
 RTS           5
* RECEIVE (AND ECHO) TABLE      *
* CONVERTS BAUDOT TO SCREEN     *
* CODE.                         *
* $FF=CARRIAGE RETURN           *
* $FE=FIGURES SHIFT             *
* $FD=LETTERS SHIFT             *
* $80=NOTHING                   *
LTRS   FCB  $80,$45,$FF,$41  E A
 FCB  $60,$53,$49,$55  SIU
 FCB  $80,$44,$52,$4A  DRJ
 FCC  \NFCK\
 FCC  \TZLW\
 FCC  \HYPQ\
 FCB  $4F,$42,$47,$FE OBG
 FCB  $4D,$58,$56,$FD MXV
FIGS   FCB  $80,$73,$FF,$6D  3 -
 FCB  $60,$5E,$78,$77  ^87
 FCB  $80,$64,$74,$67  $4'
 FCB  $6C,$61,$7A,$68 ,!:(
 FCB  $75,$62,$69,$72 5")2
 FCB  $63,$76,$70,$71 #601
 FCB  $79,$7F,$66,$FE 97&
 FCB  $6E,$6F,$7B,$FD ./:
* TRANSMIT TABLE CONVERTS KEYS *
* TO BAUDOT.                    *
* BIT 7=CONTROL                 *
*         $FF=SPACE             *
*         $FE=ENTER (CR)        *
*         $FD=CLEAR             *
*         $FC=BREAK             *
*         $80=NOTHING           *
* BIT 6=NEEDS LETTERS SHIFT     *
* BIT 5=NEEDS FIGURES SHIFT     *
* BITS 4-0=BAUDOT CODE          *
TXTAB  FCB  $80,$43,$59,$4E  ABC
 FCB  $49,$41,$4D,$5A DEFG
 FCB  $54,$46,$4B,$4F HIJK
 FCB  $52,$5C,$4C,$58 LMNO
 FCB  $56,$57,$4A,$45 PQRS
 FCB  $50,$47,$5E,$53 TUVW
 FCB  $5D,$55,$51,$25 XYZ^
 FCB  $80,$80,$80,$FF
 FCB  $36,$37,$33,$21 0123
 FCB  $2A,$30,$35,$27 4567
 FCB  $26,$38,$2E,$3E 89:;
 FCB  $2C,$23,$3C,$3D ,-./
 FCB  $FE,$FD,$FC,$80
 FCB  $80,$80,$80,$80
TXTAB1 FCB  $80,$43,$59,$4E  ABC
 FCB  $49,$41,$4D,$5A DEFG
 FCB  $54,$46,$4B,$4F HIJK
 FCB  $52,$5C,$4C,$48 LMNO
 FCB  $56,$57,$4A,$45 PQRS
 FCB  $50,$47,$5E,$53 TUVW
 FCB  $5D,$55,$51,$25 XYZ^
 FCB  $80,$80,$80,$FF
 FCB  $80,$2D,$31,$34  !"#
 FCB  $29,$80,$3A,$2B $ &'
 FCB  $2F,$32,$80,$80 ()
 FCB  $80,$80,$80,$39     ?
 FCB  $FE,$FD,$FC,$80
 FCB  $80,$80,$80,$80
LABELR FCCS "RTTY RECEIVE     "
 FCCS " MARK-->&lt;--SPACE"
LABELT FCCS "TRANSMIT"
* TONE 89-74 9876543210987654  *
TXBUF  EQU  *
 END  START
```

```
10 PCLEAR 8
20 FOR M=&HE00 TO &H12D9
30 READ D
40 POKE M,D
50 NEXT M
60 SAVEM"RTTY.BIN",&HE00,&H1D29,&HE00
99 END
1000 DATA 204,52,60,247,255,1,183,255,3,183,255,33,247,255,35,26
1010 DATA 80,15,66,204,254,248,221,64,142,18,218,221,68,221,70,221
1020 DATA 72,15,74,15,75,142,18,2,159,78,159,95,15,83,15,88
1030 DATA 142,4,0,206,18,178,166,192,167,128,140,4,32,37,247,204
1040 DATA 96,96,237,129,140,6,0,37,249,142,5,224,159,76,134,191
1050 DATA 167,132,142,5,160,159,93,134,159,167,132,141,86,141,2,32
1060 DATA 250,158,95,166,134,43,48,129,96,38,2,141,64,158,93,167
1070 DATA 128,140,5,192,37,26,142,4,32,236,136,32,237,129,140,5
1080 DATA 160,37,246,204,96,96,237,129,140,5,192,37,249,142,5,160
1090 DATA 159,93,134,159,167,132,57,76,38,8,134,96,167,159,0,93
1100 DATA 32,212,76,38,5,142,18,34,32,6,76,38,5,142,18,2
1110 DATA 159,95,57,150,83,39,3,23,0,239,15,89,15,90,15,86
1120 DATA 198,19,141,120,220,85,129,82,37,7,33,254,90,42,10,32
1130 DATA 226,92,43,2,32,3,204,0,127,215,86,79,214,85,211,89
1140 DATA 221,89,131,5,32,36,6,172,1,172,1,32,211,221,89,134
1150 DATA 5,151,91,204,0,19,151,86,151,87,141,64,79,214,85,211
1160 DATA 89,221,89,131,5,32,36,15,220,85,129,82,201,0,215,86
1170 DATA 12,87,18,198,18,32,227,221,89,214,86,88,209,87,6,92
1180 DATA 10,91,38,207,172,148,198,8,141,18,79,214,85,211,89,221
1190 DATA 89,131,2,144,37,238,150,92,68,68,68,57,141,76,79,211
1200 DATA 89,221,89,204,0,2,141,66,203,2,141,58,203,2,141,54
1210 DATA 215,85,192,89,80,43,2,32,3,204,0,0,193,15,34,2
1220 DATA 32,3,204,0,15,209,88,38,6,61,61,172,139,32,19,142
1230 DATA 4,16,166,133,132,191,167,133,150,88,215,88,230,134,202,64
1240 DATA 231,134,23,1,38,57,172,1,172,1,134,1,92,193,96,37
1250 DATA 4,161,1,32,5,181,255,32,39,242,92,193,96,37,4,161
1260 DATA 1,32,5,181,255,32,38,242,57,142,4,5,206,18,210,166
1270 DATA 192,167,128,140,4,13,37,247,204,52,60,247,255,33,183,255
1280 DATA 1,134,2,183,255,32,15,89,15,90,158,70,156,68,39,36
1290 DATA 204,15,97,221,81,134,5,151,91,230,128,159,70,215,92,95
1300 DATA 141,84,172,148,204,0,8,90,38,253,4,92,141,72,10,91
1310 DATA 38,242,236,155,61,172,139,204,21,172,221,81,83,141,55,150
1320 DATA 83,36,199,204,52,60,183,255,33,247,255,1,142,4,5,206
1330 DATA 18,183,166,192,167,128,140,4,13,37,247,57,182,255,32,138
1340 DATA 2,183,255,32,134,42,151,80,57,182,255,32,132,253,183,255
1350 DATA 32,134,39,151,80,57,36,4,141,226,32,4,141,235,32,0
1360 DATA 128,29,74,38,253,182,255,32,136,252,183,255,32,214,80,79
1370 DATA 211,89,221,89,147,81,36,8,141,15,150,80,128,35,32,226
1380 DATA 221,89,57,172,148,61,172,1,57,150,66,38,124,220,64,192
1390 DATA 55,73,138,1,36,2,32,3,204,254,248,221,64,142,1,82
1400 DATA 58,183,255,2,182,255,0,138,128,31,137,232,132,228,132,33
1410 DATA 254,167,132,134,7,221,66,158,68,156,70,38,198,156,72,38
1420 DATA 196,142,18,218,159,70,159,72,159,68,57,150,66,38,58,220
1430 DATA 64,192,55,73,138,1,36,2,32,3,204,254,248,221,64,142
1440 DATA 1,82,58,183,255,2,182,255,0,138,128,31,137,232,132,228
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1550 DATA 4,215,75,142,5,224,58,236,132,237,136,224,204,96,96,237
1560 DATA 129,236,132,237,136,224,204,96,96,237,132,214,75,39,4,61
1570 DATA 172,132,57,142,5,224,159,76,134,191,167,132,33,254,57,134
1580 DATA 96,167,159,0,76,159,70,204,0,32,215,75,57,158,72,156
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1610 DATA 191,167,132,172,139,57,76,38,15,18,134,96,167,159,0,76
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1630 DATA 161,1,32,11,76,38,7,142,18,2,159,78,32,1,61,61
1640 DATA 18,57,128,69,255,65,96,83,73,85,128,68,82,74,78,70
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1660 DATA 86,253,128,115,255,109,96,94,120,119,128,100,116,103,108,97
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1690 DATA 76,88,86,87,74,69,80,71,94,83,93,85,81,37,128,128
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1710 DATA 60,61,254,253,252,128,128,128,128,128,128,67,89,78,73,65
1720 DATA 77,90,84,70,75,79,82,92,76,72,86,87,74,69,80,71
1730 DATA 94,83,93,85,81,37,128,128,128,255,128,45,49,52,41,128
1740 DATA 58,43,47,50,128,128,128,128,128,57,254,253,252,128,128,128
1750 DATA 128,128,82,84,84,89,96,82,69,67,69,73,86,69,96,96
1760 DATA 96,96,96,77,65,82,75,109,109,126,124,109,109,83,80,65
1770 DATA 67,69,84,82,65,78,83,77,73,84,79,161,160,38,233,77
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Program listing 2. MAKE.RTY program to generate RTTY.BIN.

BASE, and download the program. Finally, if all of that is still too much, send me two bucks and a disk or tape, with a stamped mailer to return it to you, and I'll send you a copy. Now, that should take care of everybody.

Once again, my thanks to Marty Goodman, M.D., for giving me permission to share this valuable program. And I will take a few moments to even plug *Rainbow*, which, with several hams on the staff, is a valuable resource for anyone running versions of the CoCo.

With the listings taking up space this month, I think I will call it here. I remain available to you by mail or wire; that CompuServe ppn is 75036,2501, and my Delphi username is MARCWA3AJR. I always look forward to your comments or questions.

The next few months of RTTY Loop promise to be exciting ones. Another CoCo program will be here next month, this one complete with bells and whistles. There is some phenomenal hardware around; I'll have a look at one of the best planned, and even a book review is in the works. You sure won't want to miss any of it, so check your *73* subscription, extend it if necessary, just so you don't miss this summer's RTTY Loops! ■

73 INTERNATIONAL

NOTES FROM FN42

Items from Chile, France, and Ireland (see Roundup *below) missed deadlines, one by a few weeks and two by a few days. We hate to see that happen! If we get newsworthy material too late, we have to write about what* did *happen, not what will happen. To be sure your time-value items reach us for the appropriate issue, get them HERE as follows: first of June for the August issue, first of July for the September issue—and so on. Note to PAØVDZ: Can you send us a few paragraphs about the May VRZA 24th annual Netherlands radio camping week? (Please type it!)*

We welcome Eng. Bernard C. Herring Z21EI of Zimbabwe this month. If you think that call is Z twenty-one E I, you are wrong, as he tells you later.

June 1 is Children's Day in China, National Day in Tunisia; June 2 is Coronation Day in Great Britain, and Italy celebrates the Anniversary of the Republic. In New Zealand, it is the Queen's Birthday on the 4th, but it is on the 14th in Australia and Great Britain. Also raising a question: the Republic of Seychelles celebrates Liberation Day on the 5th and Independence Day on the 29th. What was happening during the 24-day interval? Anybody have the answers?

It is Denmark's Constitution Day on the 5th, National Holiday in Sweden the 6th, on the 10th in Portugal, and the 23rd in Luxembourg; it's Independence Day in Norway on the 7th, the 12th in the Philippines, and on the 26th for both Madagascar and Somalia.

It is Flag Day in the U.S. on the 14th and in Argentina on the 20th; it is Republic Day in Iceland on the 17th, and on the 24th it is King's Day in Spain and Peasant's Day in Peru.

Fathers in the U.S.: We get celebrated on the 21st.

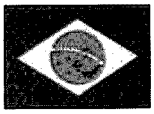
ROUNDUP

Chile. The Federacion de Clubes de Radioaficionados de Chile activated 3G 87 PAX April 1st to 19th in honor of H.H. Pope John Paul II on the occasion of his visit to Chile and his endless work on behalf of worldwide peace (see QSL card). QSL info: PO Box 72, Valparaiso, Chile. Oscar Cabello Araya CE3AFX is FEDERACHI president.

France. The Centre d'Animation de Cognac and Reseau des Emetteurs Francais commemorated World Telecommunications Day (May 17) with demonstrations and a philatelic exposition covering the field of communications from telegraphy to microwaves. A special four-color cover with a special French PTT cancellation design was issued and is available for six IRCs, postpaid, from Mr. Raymond Aupetit at the following address: 14, Residence Bois Boutin, F-16340 L'Isle d'Espagnac, France.

Ireland. If EI1DF, -1DH, -2AW, -2EM, -3DY, -6AI, -6BUB, -7FT, -8EQ, -9DB, -9DM, -ØDA, or -ØDJ popped up on your HT in April, you were hearing evidence of the Irish invasion at, or en route to, or from Dayton. EI9BT reports that the last batch of QSL cards processed weighed more than 27 kg (more than 60 pounds) and took 41 man-hours to sort.

QSL honoring the visit of Pope John Paul II to Chile.



BRAZIL

Gilberto Affonso Penna PY1AFA, Director
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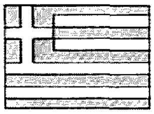
Caixa Postal 1131
20001 Rio de Janeiro, RJ
Brazil

The Antenna Edicoes Tecnicas Ltda. (address above) reminds us of the 1987 WWSA (World Wide South America) CW Contest, on all HF bands for 24 hours, June 13/14. Other awards "can be easily obtained during WWSA," PPC, WAPY, GPCW, CWRJ; "there are many more." Sponsored by the Brazilian amateur radio magazine, *Electronica Popular*, the Grupo Argentino de CW, and the Pica-Pau Carioca CW group (see box for details), 1986 entries came from 37 countries or DX areas. Table 1 lists the top scorers.

Band/Area	(DX / S. A.)
3.5 MHz	LZ2AX
7 MHz	UA4HNP / CX8BBH
14 MHz	LZ1YE / PY4WAS
21 MHz	G6ZY/EA6 / PY5AKW
28 MHz	OK1DBM / LU3DSI
Multiband	OH4RH / PY2RRG
Multi-op	OH1AF / CX7BY
SWL	LZ1I244
Multiband, single-op winners:	
Africa	EA5YU/EA8
Asia	JA4UYB
Europe	OH4RH
N. America	W3GM
S. America	PY2RRG
Multiband, multi-op leaders:	
Asia	JA3YBF
Europe	OH1AF
S. America	CX7BY

Table 1. Top scorers in the 1986 WWSA CW Contest.



GREECE

Manos Darkadakis SV1IW
Box 23051
11210 Athens
Greece

Hobby 85. Those who talked with J41SV a few months ago

WORLD WIDE SOUTH AMERICA CW CONTEST—WWSA

Sponsored by "Antenna-Eletronica Popular" magazine, Rio de Janeiro, Brazil; supervised by "GACW," Argentine CW Group, Buenos Aires, Argentine, and "PPC," Pica-Pau Carioca Group, Rio de Janeiro, Brazil, with the cooperation of several well-known South American Amateur Radio Societies and CW Groups.

PURPOSE—Contacts between stations in all countries.

CONTEST PERIOD—Annually, every second complete weekend of June, from 1500 UTC Saturday to 1500 UTC Sunday.

BANDS—1.8, 3.5, 7, 14, 21, 28 MHz. Crossband contacts are not valid.

CLASSIFICATIONS—CW mode (2-way) only. Single operator, single band or all bands; multi-operator, single transmitter, all bands; SWL.

CALL—CQ SA TEST.

EXCHANGE—RST/QSO number starting from 001.

POINTS—Each QSO in own country 0 points: only as a multiplier. QSO in same continent, 2 points; with other continent, 4 points. Contacts with South American stations (only for OX stations), 8 points.

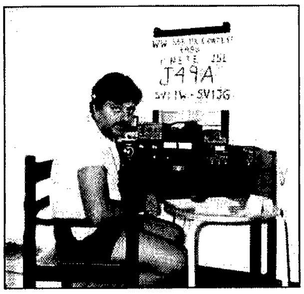
MULTIPLIERS—Different countries (DXCC list) and different South American prefixes worked in each band.

SCORING—The final score is the total QSO points multiplied by the sum of total multipliers from all bands.

CONTEST AWARDS—Certificates will be granted to 3 top-scoring stations of each class in country, reasonable score provided. Results of South American entries and of other continents will be listed separately.

LOGS—A separate log for each worked band must be sent no later than 31 August to WWSA Contest Committee (PSE follow standard international contests logging rules).

MAILING ADDRESS—WWSA Contest Committee, PO Box 18003, 20772 Rio de Janeiro, RJ, Brazil.



SV1IW on Crete.

probably did not know he was operating from the "Hobby 85" exposition. This was a big effort to promote amateur radio; the local Yaesu and ICOM dealers and a lot of us gave equipment for it, so J41SV was able to operate CW, FM, SSB, RTTY, ATV, and by satellite. There also was a PC—Sinclair's 2X Spectrum (Timex 2068)—which monitored AMSAT's AO-10 continuously. Among those working hard to accomplish this were SV1OE, -VS, -TY, -VT, and -LY.

Contesting. I would like to share with you the experiences I got from my participation last November on the *CQ* WW SSB Contest. This was the first time after at least five years that I was seriously involved with a contest. SV operators don't take contests very seriously; many of us consider a contest to be nothing more than QRM on all bands.

Anyway, Cliff SV1JG and I had wanted for some time to do a contest and we decided the *CQ* WW would be just right. We also thought that participating from SV9 would be an even better idea, so we did. We got a special call (J49A) and a 48-hour allocation of a single frequency high up in the 80-meter SSB band (3784 kHz ±2.1).

We headed for Crete three days early, and after a brief stop in Heraklion took the road headed southeast to a little town Cliff knew, where we had booked rooms. The weather was great—blue sky, sunshine, 65 degrees. [As he wrote these words later, back home, SV1IW was experiencing the worst weather Greece has had for 50 years: 10" of snow in Athens, halting everything, many villages isolated and being supplied with daily food through helicopter drops.]

We brought with us two ICOM IC-751s, two Dentron MLS-2500s, Tuners Earphone swr's; we also had a couple of HTs for antenna adjustments and communication with local hams through the SV9SV repeater (see Table 2 for updated repeater list). In a couple of hours we had the antennas up on the hotel roof, which was 350' by 150': a Hidaka 3-el, 3-band beam for 10/15/20 meters, a Butternut vertical for 40/80, and a full-size dipole for 160.

Since we were early, we enjoyed the local food and scenery and operated with our own calls/SV9 mostly on CW and on the low bands, making about 1,500 QSOs apiece, and making quite a few U.S. hams happy with 160-meter contacts.

We rested Friday evening, and then at 0000 UTC entered the contest battlefield. Conditions were not the best, and on 80 were impossible: All we got was a steady 59 +40 dB carrier right on top of the frequency.

We could hear active U.S. stations on Top Band, but we couldn't get in touch with any despite our success before the contest opened. We did manage about 3,500 QSOs, however, with almost 500 of them during one three-hour period on Sunday morning on 10 meters. It might have been well over 5,000 except for two unfortunate events: interfering with the only Greek in the hotel trying to watch Saturday night basketball and some German neighbors disturbed on Sunday.

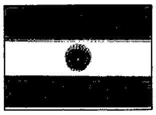
A few SV9 ops came by the hotel to visit us, and also an Austrian ham (OE3DIM) on vacation. All in all we had a great time, and I hope this year maybe we can make it from the Dodecanese. I experienced very good discipline and operating habits from all participants in the contest; and I must express gratitude for help on the part of John SV9LM and his hospitality.

R1	Athens	145.625/.025
R2	Lefkas Island	145.650/.050
	Thessalonika	145.650/.050
R3	Crete	145.675/.075
R4	Kefalonia Isl.	145.700/.100
R5	Pilio Mt.	145.725/.125
R6	Thessalonika	145.750/.150
R7	Athens	145.775/.175
RØ	Taigetos Mt.	145.600/.000
RU5	Athens	434.725/433.125

Transponder: Thesalonkia (linking R1 in Athens and RU1 in Thesalonika

Table 2. Greek repeaters.

The J41SV "Hobby 85" station.



INDIA

S. G. Gopalaswamy VU2GOP
Box 5053
Bangalore - 560 001
India

(The following paragraphs are edited excerpts from a story passed on to us by Srikanth VU2GSM, Secretary, the Bangalore Amateur Radio Club (BARC). Nothing earth-shaking, just a relaxed and humorous tale written by an everyday ham about everyday hams who were having fun, enjoying themselves, and not taking life too seriously. More of us should be so happy!—Ed.)

We were planning for the 10th National Jamboree to be held at Palace Grounds, Bangalore. Our function was to enable exchanges of greetings by Cubs, Scouts, Rovers, Bulbuls, Guides, and Rangers (some 20,000 of them from all over India, plus some contingents from Australia, Denmark, Indonesia, Nepal, Pakistan, and Sri Lanka).

Our club secretary said (among other things): "Why should we shout through a dipole for a special occasion? Why can't we just talk through something special, like a quad?"

Novices rush in where old-timers fear to tread; we who had never even properly seen a quad gathered available material, hired a jetka [horse-drawn cart] to carry it, and set off with the secretary's last words in mind: *For once let's have something that looks good, too! It will be seen by many!*

Four bamboos from the bazaar and four from an OT—which he was reluctantly happy to get rid of (and which arrived carried over the shoulder of a pillion rider on a motorcycle)—were painted in alternating one-foot lengths of black and white. A donated treasured spider was repainted, and the copper laid out, marked, and cut.

Plain luck and a smart salute to the jamboree camp Major got us 12 flagpole sections (2-1/5" x 4 feet); we whisked them away quickly before he could change his mind, assembled them on the ground, and fastened them on the spider. We picked the spot to erect the quad by figuring out where we would NOT be if it fell over; we had plenty of coax.

Four bamboos were clamped on, four persons held wire in place while a fifth twisted short lengths of GI to hold it to the bamboo; the mast was lifted and rotated, and held up off the ground while the other four bamboos were clamped on from underneath, wired, and the coax fastened. A rope was borrowed from a nearby fire station, and the whole thing erected, with the mast slipping into a 1-1/2-foot-deep hole, which was

then packed with stones and topped with mud.

The lightest among us climbed a ladder we held to fasten guy wires. A watching OT warned us, "Watch the guys, they have a bad habit of getting loose." Because of the jamboree setting, we thought he said, "Watch the guides..." and were confused more when the club secretary said they *should* be loose. But he added, clearing it up, "so the mast can be rotated."

Then came the expert comments: *It is not in the right direction. It is the long path...south path...wrong path...south south east... no, the sun*—and so on. Thank goodness it wasn't night with the moon and stars to go by. Nobody had a compass.

We beat it to the tent...1:1.5 swr! A half-hearted CQ on 14 and VKs came thundering in! A rope had been tied to one of the bamboo spreaders, and when it was pulled, the mast rotated at one of the section couplings: It followed a pull like a tame cow. Many countries were contacted, and our operators had much fun running out to rotate the quad and be overjoyed at the improved signal strengths.

The antenna field and shack.

All the time we had hundreds of onlookers, and passersby were mighty curious. Kids decided it was a Ferris wheel and tried to figure out where they would sit. Many onlookers became more aware of amateur radio, and that alone was enough reason to build the demonstration station. Many visited the shack, including VK2ATJ, who took snaps and congratulated us. The silver mast and black-and-white extended arms were a sight to see, and to us it was a splendor to look up at. We had shared moments of eagerness, anxiety, pleasure, and now we would have treasured memories.

VU2GOP wrote that they had four stations going, with VU2JOA and VU2ARC the calls most used on this occasion (January 3-9, 1986). It was a highlight for the "26th year of service" of BARC, and "the first time a quad has been erected under Field Day conditions by the club, and the details have been written down for sheer pleasure." Thanks for sharing them with us!—Ed.

ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
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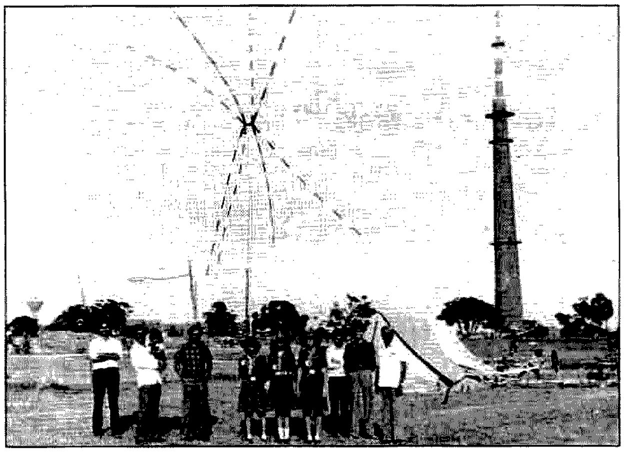
Israel

(Ron writes us that a few days after Alon 4Z4ZB's OSO with the space shuttle Challenger, *he was at the airport waiting for an arriving plane and passing the time with chit-chat on his HT. Security police accosted him, but were all smiles when he showed them his ham license. They had immediately recalled the OSO publicity in Israel's 1.3 million circulation newspaper,* Yediot Ahronot, *with a four-color, two-column photo of 4Z4ZB in his OTH. Following are excerpts from the August 5, 1985, story, translated by 4Z4MK.)*

"Four Zebra Four Zebra Bravo calling to Whiskey Zero Oscar Romeo Echo." With the antenna at an angle 45 degrees to the sky and a prayer in the heart, Alon Tavor sent from the Shoresh farm in the Jerusalem hills a wireless call to the heavens. The reply was immediate, as though the speaker were in an adjacent room and not on the deck of the Space Shuttle. "*Challenger*. Hear you loud and clear. My name is Tony and I'm a crew man of the *Challenger*." [Tony England WØORE]



VU2PTT is busy pressing the PTT, while VU2GSM, VU2GRU, and scouts look on.

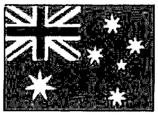
During the minute-and-a-half conversation, Alon told of the Shoresh farm village 15 miles west of Jerusalem and Tony told how beautiful Israel looked from above, at a height of 350 km.

Alon Tavor was excited. From his wheelchair, to which he has been confined for over ten years, he has already managed to speak with the whole world...and from his setup that takes no more space than a regular stereo system, he even receives written communications by means of a computer.

"[Newspapers] should write about us a bit more," Alon said. "This hobby needs new blood, and it's a whole world in itself. It is true that amateurs are not allowed to talk about politics or business, but it's a fascinating hobby."

On his bookshelves where his instruments lie sits a small trophy, "The Outstanding Radio Amateur for the Year 1982." Alan received it after establishing an amateur radio club in the Alyn Hospital for Crippled Children in Jerusalem. "I saw how much it (the hobby) helped me in my rehabilitation, and I decided to help others, too. A week ago, I started something similar in the San Simon Invalids Home in Jerusalem."

Another view of the antenna field. BARC does not claim that it erected the 10-kW TV tower for the jamboree. Posing for this shot were VU2RRN, -2UVX, -2GSM, -2GRU, -2PTT, and friends.



NORFOLK ISLAND

Kirsti Jenkins-Smith VK9NL
PO Box 90
Norfolk Island 2899
Australia

VK9 Station Locations. There appears to be some confusion about the VK9 stations listed in the *Callbook*. First of all, the VK9 section includes all VK9 call areas, resulting in some mail arriving addressed to VK9NL/NS, Cocos (Keeling), Christmas Island, Willis Island, Norfolk Island. Better to be safe than sorry, but basically the N in the suffix of the call stands for Norfolk Island. VK9X indicates Christmas Island, VK9Y Cocos (Keeling), VK9Z Willis Island, VK9M Mellish Reef, and VK9L Lord Howe Island.

In the past, VK9 operators could choose their suffix and most opted for their initials. At present, only one such old-timer is still active from Norfolk Island, namely, John Anderson VK9JA. All others here have VK9N–.

The book also lists a number of people who have at one time or another been active from Norfolk Island: while on DXpeditions or temporarily resident. The only current operators who will receive mail addressed to Norfolk Island are: VK9ND, –NI, –NL, –NS, –JA, –NNB, and –NNZ. Les VK9NI is listed under two calls. He formerly held VK9NO, but acquired his present call when Charlie, the former VK9NI, decided to give up amateur radio.

It may be possible to obtain alternative QSL routes for the other callsigns listed in the *Callbook* from manager lists and QSL information in DX bulletins, etc. However, most of these people have been gone from the Island for some time and may be difficult to track down.

Jim VK9NS, being a member of the WIA and its bureau, recently received four kg of unsolicited QSL cards from the bureau—some 1,600 cards. As direct QSLs with SAE and postage take first priority, it will be some time before the chore of checking logs for them is finished.

VK9N Activities. With some improvement in propagation, we have been able to catch up with some of our long-lost friends, and we enjoyed a beeline propagation path to Peter I Island, enabling us to get in the Peter I log early on both SSB and CW.

Jim VK9NS has been absent, DXpeditioning to Cocos (Keeling) and Christmas during February, resulting in a marked decrease in activity from here despite the addition of Ray VK9NNZ among us. Ray formerly held P29NRS; as Norfolk Island comes under Australian regulations, his Novice license allows him to operate on 3.525–3.625 MHz, 21.125–21.200 MHz, and 28.100–28.600 MHz. There is another Novice here, VK9NNB, but he does not appear to be very active.

Tom Christian VR6TC arrived here toward the end of 1986 to await a shipping opportunity to Pitcairn and to recuperate after hospitalization in New Zealand. Staying with John VK9JA, he kept regular skeds with his wife, Betty VR6YL. As I write this, he is homebound on the Norwegian expedition ship, *Aurora*, which was used to transport the mapping and amateur radio expedition to Peter I. The ship had just picked up her owner, Monica Christensen, who had spent the Antarctic summer skiing to the South Pole—the first woman to have done that.

Contest participation in 1986 saw VK9NS coming in first in Oceania as Single-Op, Multiband, Phone, in the WPX contest. He also entered the phone section of the *CQ* WW contest in October; VK9NL entered the CW section in November. Propagation during the phone weekend was excellent, but not during the CW weekend, resulting in fewer than 2,000 contacts.

L to R: Jim VK9NS, Tom's daughter, and Tom VR6CT.

ZIMBABWE

Bernard C. Herring Z21EI
PO Box 2234
Bulawayo
Zimbabwe

Welcome to Zimbabwe [Rhodesia before it became independent], a landlocked country situated on the 19th south parallel in southern Africa. Zimbabwe is commonly acknowledged by African continental travelers to be one of the most beautiful of the African countries. It possesses a modern infrastructure of road, rail, and air communications, and its cities and developed countryside are the surprise and envy of visitors from all over the world.

Much of the country comprises a plateau between 3,000 and 6,000 feet above sea level. The climate is exceptionally benign, with cool winters and warm to hot summers tempered by rainfall.

Although Zimbabwe lies entirely in the tropics, the jungles-of-Hollywood epics don't exist here. The countryside is open rolling savannah, highly suitable for agricultural production, conditioned only by relatively low average rainfall of about 32 inches.

Tourist attractions include Victoria Falls, 300 feet high; Lake Kariba, one of the world's largest man-made lakes; and mysterious ruins dating back many centuries. There are extensive game parks with large populations of elephant, lion, giraffe, and many other species. There is almost permanent sunshine.

Amateur radio has long been a popular hobby in Zimbabwe. As Rhodesia, callsigns were ZE–. After independence in 1980, our prefix became Z2, following by one number (1 through 8) and two letters. Designating the two numbers together as "twenty-one" is incorrect. My call is Z two, one E I. This form may have something to do with the callsign for Zimbabwe being shown as "Z22" on one popular ham map.

As far as amateur operation is concerned, we have reciprocity only with the United Kingdom. Permission to operate an amateur radio station in Zimbabwe is controlled by the Posts and Telecommunications Corp. Applications should be addressed to: The Licensing Officer, Posts and Telecommunications Corp., PO Box 8061, Causeway, Zimbabwe. [*It's important to give all details of proposed visits and get permission to bring equipment into the country before doing so. It could be helpful to get a Z2 amateur to apply on your behalf. —Ed.*]

There are around 90 fully licensed amateur stations in the country now, together with a small number of "restricted" and "Novice" licenses. Here, the license is granted to the *station*, the individual having satisfied the authorities that he's competent to operate. Examinations are broadly in line with most other countries: 12-wpm Morse code and written papers on basic technicalities and operating procedures.

In common with many developing nations, amateur radio equipment is very difficult to obtain. Components are equally scarce, but a certain amount of homebrewing is possible, and some remarkable feats have been achieved. One of our amateurs (then ZE5JJ) was the first in Africa to establish a very successful moonbounce station, complete with 32-foot diameter dish.

Two VHF repeaters are in operation: one in Harare, the capital city, and one in Bulawayo, the next largest city. Bulawayo also houses a 10-meter beacon, Z21ANB on 21.250 MHz, often used by foreign DXers to check the path into southern Africa. All the internationally agreed bands are available to Zimbabwe amateurs, with minor variations. We were among the first of the world's countries to open the WARC bands (10, 18, and 24) to our amateurs.

Our hobby is represented by the Zimbabwe Amateur Radio Society, PO Box 2377, Harare, Zimbabwe. It runs our very efficient QSL bureau, compiles the local callbook, and produces monthly broadcast bulletins. Training courses are available for aspiring amateurs, and slow Morse transmissions arranged. The Society is planning to initiate a Certificate for DX hounds; details soon.

Best 73 de Z21EI. ■

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Your company name and message can contain up to 25 words for as little as $199 yearly (prepaid), or $50 for three months (prepaid). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the August '87 issue must be in our hands by June 1st. Mail to *73 Amateur Radio*, WGE Center, Peterborough, NH 03458. ATTN: Hope Currier.

PROPAGATION

Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA							20	20				
ARGENTINA								15	15	15	15	15
AUSTRALIA						40	20	20			15	15
CANAL ZONE	20	40	40	40	40		20	15	15	15	15	20
ENGLAND	40	40	40				20	20	20	20		
HAWAII		20			40	40	20	20				15
INDIA							20	20				
JAPAN							20	20				
MEXICO		40	40	40	40		20	15	15	15	15	
PHILIPPINES							20	20				
PUERTO RICO		40	40	40			20	15	15	15	15	
SOUTH AFRICA									15	15	15	
U.S.S.R.							20	20				
WEST COAST			80	80	40	40	40	20	20	20		

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20	20						15				
ARGENTINA										15	15	15
AUSTRALIA	15	20				40	20	20				15
CANAL ZONE	20	20	40	40	40	40			15	15	15	20
ENGLAND		40	40					20	20	20	20	
HAWAII	15	20	20	20	40	40	40					15
INDIA								20	20			
JAPAN								20	20			
MEXICO	20	20	40	40	40	40			15	15	15	20
PHILIPPINES								20	20			
PUERTO RICO	20	20	40	40	40	40			15	15	15	20
SOUTH AFRICA										15	15	20
U.S.S.R.								20	20			

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20	20	20		40	40	40	40				15
ARGENTINA	15	20		40	40	40					15	15
AUSTRALIA		15	20	20			40	40				
CANAL ZONE			20	20	20	20	20	20				15
ENGLAND									20	20		
HAWAII	15	20	20	40	40	40	40					15
INDIA		20	20									
JAPAN	20	20	20			40	40	40			20	20
MEXICO			20	20	20	20	20					15
PHILIPPINES	15						40		20			
PUERTO RICO			20	20	20	20	20	20				15
SOUTH AFRICA										15	15	
U.S.S.R.									20			
EAST COAST		80	80	40	40	40	40	20	20	20		

Very poor HF propagation is expected for the first two weeks of June. Expect severe geophysical phenomena—at the very least some geomagnetic storms—this fortnight. Look for very good VHF propagation during this same time period, including auroral and weather-front propagation from 6 meters through 220 or 450 MHz. The last half of the month will show excellent HF conditions and a quiet geomagnetic field. DX will be good but not great, with openings in the late evening on 20 meters.

JUNE

SUN	MON	TUE	WED	THU	FRI	SAT
	1 P-F	2 F	3 F	4 F-P	5 P	6 P
6 P	8 P	9 P	10 P	11 P	12 P-F	13 F
14 F-G	15 G	16 G	16 G	18 G	19 G	20 G
21 G	22 G	23 G	24 G	25 G-F	26 F	27 F-G
28 G	29 G	30 G				

JULY 1987
Issue # 322

73 Amateur Radio

USA $2.95
CAN. $3.95
A WGE Publication

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NEVER SAY DIE

IF MORSE CODE MAKES YOU CRAZY

While most of the Extra-class hams I know quite clearly qualify for admission to the nearest funny farm, I got to wondering about a few Extras who seemed just peculiar, but not really off-the-wall crazy. Could there possibly be a hole in my theory that Morse code at 20 wpm burns out the sanity links in the brain?

In-depth interviews with several seemingly semi-rational Extras uncovered a dimension I'd failed to consider. It turns out there was, in the past, a way to get the Extra license without blowing the brain's fuses.

In every single case, the seemingly semi-rational Extra-class licensees admitted to using the Bash System to get their ticket and related funny call. It appears that with the Bash System there was no need to learn the code at all since Bash provided the exact copy for the FCC-run code exams. All one had to do was copy it down while the code was playing.

You know, I never thought amateur radio would have a reason to thank Dick Bash for his most lucrative work. Bash did open the flood gates for a while, enabling tens of thousands of people to get their ham tickets with virtually no understanding of either theory or code. Alas, the VEC program scuttled Dick's cheat-sheet empire.

Have you noticed what a high percentage of Extras wear camouflage socks? Sure sign.

Is it too late to nominate Dick for the Ham Of The Year award? Perhaps the Ham of Yesteryear.

GOING DIGITAL

The telephone companies have been digitizing voice in order to cram more conversations over their wires for over 25 years. These days many telephone switching systems automatically digitize voices for efficient handling and then convert them back to analog again.

Have you ever heard a digitized voice circuit on a ham band? I haven't. I don't even recall seeing any articles on the subject in a ham magazine. I realize that most of you are getting old and are too tired to bother experimenting with new technologies, but after twenty-five years, how about at least experimenting with what's by now an old technology?

We hams are supposed to be the leaders—the pioneers—hell, it's in our rules! Yes, I know, Incentive Licensing knocked the stuffing out of our hobby 24 years

Continued on p. 10

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

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Subscription Information

Rates: in the United States and Possessions: One Year (12 issues) $24.97; Two Years (24 issues) $45.47. Elsewhere: Canada and Mexico—$39.00/1 year only, US funds. Foreign surface mail—$45.00/1 year only, US funds drawn on US bank. Foreign air mail—please inquire. To subscribe, renew or change an address: Write to Subscription Department, PO Box 931, Farmingdale NY 11737. Return postage guaranteed. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients. For questions concerning your subscription, call toll free 1-800-227-5782. To place subscription orders, please call us toll free at 1-800-722-7790 between 9 am and 4:30 pm Eastern time or write to *73*, Subscription Department, PO Box 931, Farmingdale NY 11737. ***73 Amateur Radio*** (ISSN 0745-080X) is published monthly by WGE Publishing, WGE Center, Peterborough NH 03458-1194. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Canadian second class mail registration number 9566. Microfilm Edition—University Microfilm, Ann Arbor MI 48106. Postmaster: Send address changes to *73 Amateur Radio*, Subscription Services, PO Box 931, Farmingdale NY 11737. Nationally distributed by International Circulation Distributors. **Contract:** Too bad—merely reading this is a binding contract between you and the publisher. To get more pages for *73*, more advertising is necessary. To get more advertising, more readers are needed. You hereby agree to be an official *73* subscription agent. You will tell every ham you contact that you read about him in *73* this month so he'll rush out to buy a copy. It's just a little Green lie, so stop sweating. It'll work. He'll frantically read every word in the magazine, discovering its magnificence in the process. Look, if reason doesn't work we'll have to use subterfuge.

QRX . . .

And The Winner Is . . .

DAVID LaFLEUR KA1MAF is the winner of *73*'s **Instant ICOM Sweepstakes**. Dave's card was drawn from over 15,000 entries at the Dayton Hamvention. Wayne W2NSD plucked the lucky card out of the barrel (see the photo). As you read this, Dave is tuning up an ICOM dream station consisting of: an IC-735 all-band, all-mode, 100-Watt HF transceiver/general-coverage receiver; a PS-55 switching power supply: an SM-10 desk microphone with built-in graphic equalizer; an AT-150 automatic antenna tuner; and a GC-5 world clock to keep track of all the hours he spends with his new station. Dave writes: "I was really surprised that I won this station. I just sent in a couple of entries. I've been putting off working on getting my General license, but now that I've got something new to use it's time to start working on it." *73* would like to congratulate KA1MAF and thank ICOM America, Inc., for making it all possible. Keep an eye out for more *73* sweepstakes—you could be our next big winner.

W2NSD draws the winner of the Instant ICOM Sweepstakes.

Free Lunch

HAMS ARE CHEAP. But even the stingiest ham recognizes a deal when he sees one. If you enter the *73*/ICOM Golden Gigahertz Contest you will receive a free hat and T-shirt, courtesy of ICOM. If you want to see what they look like, take a gander at what Wayne is wearing on last month's cover. No strings attached, no minimum score, no tricks. Your total investment is 22¢ for the stamp plus wear-and-tear on your pencil. See the complete rules on page 23 and fill out the coupon. Then we'll see you on 1.2 GHz on July 13–14.

Novice World

ICOM IS PUBLISHING a newletter called *Novice World* which is aimed at building the confidence of new Novices and getting them on the air with a minimum amount of trouble. The first issue covers an explanation of Novice Enhancement, tells you how to set up your first station, gives you step-by-step instructions on what to say during that first QSO, explains what some of the bells and whistles on modern equipment do, lists the propagation characteristics of the various amateur bands, tells you how to construct a dipole, and gives you a quick-reference Novice frequency allocation chart. *Novice World* assumes that you have no real *practical* knowledge of ham radio, and this "let's start from the beginning" tone is what a lot of Novices have been searching for. ICOM is currently the leader in providing equipment for the "Enhanced Novice," and *Novice World* is an attempt to further solidify that position. The text is sprinkled with references to ICOM's full line of gear for the Novice, but the sales pitch is low-key and explanations of basic practices and technical matters are brandless. *Novice World* is FREE and to get it all you have to do is write to: ICOM's *Novice World*, c/o ICOM America, Inc., 2380 116th Avenue NE, Bellevue WA 98004.

It's Big

AS PROMISED last month in QRX, details of *73*'s new contests, **The National Championships (September 5–6)**, are available on page 30. We've finally made it possible for the "Little Gun" to have a chance at winning—using guile instead of gigawatts. The rules are complicated, so read them carefully and devise a strategy. For a complete set of entry forms, send a SASE to The National Championships, 2665 Busby Road, Oak Harbor WA 98277.

A Few Good OMs/YLs

***73*'s CONTEST PROGRAM** is rapidly expanding (as you may have noticed from the preceding two stories). We have immediate openings for a contest chairman, an awards manager, and a public relations manager. If you are interested in becoming part of *73*'s contest coordination team, drop a note to Bill Gosney KE7C, 2665 Busby Road, Oak Harbor WA 98277.

Scout Skeds

BOY SCOUTS AND GIRL GUIDES from the province of Ontario will be exposed to amateur radio at **Future Challenge '87**, a one-week program of high-tech experiences designed to allow our youth to experience this very important aspect of their future. Future Challenge '87 will be held from August 16–23 at Conestoga College in Kitchener, Ontario. The Future Challenge '87 ham station will operate as VE3SHO using all bands and modes; the packet system can be reached @ VE3EUK. The organizers would like amateurs to contact VE3SHQ to encourage the Scouts/Guides to explore the world of amateur radio. If you'd like to set up a sked, write to: Future Challenge '87, c/o Gerry Curry VE3MAX, RR #1, Millgrove, Ontario L0R 1V0 Canada.

Summertime

VISITORS to the offices of *73* are always welcome, and because we're located in such a beautiful vacation spot, faithful readers start dropping by once the weather warms up. Work on our new $7.3 million visitor center continues on schedule, but we appear to be

having some trouble getting the full-size replica of Victoria Falls to work. But seriously, folks, we've just put together a brand-spanking-new, state-of-the-art station, and if you want to drop by and operate for a few minutes with a signal that'll knock your socks off, come on up. Don't drive all the way from Dubuque just for our five-minute tour, but if you're in the area, please stop on in. In the photo you can see our new Sommer multiband HF beam being hoisted into place. Five minutes after this photo was taken it was discovered that the thrust bearing at the top of the tower was just a little tiny bit too small.

What new station would be complete without a new tower and antenna system. W2NSD's latest toy is a Sommer multiband HF beam sixty feet up.

PO Boxing

KENWOOD USA has moved. Yeah, yeah, I know we told you that last month, but since then the U.S. Postal Service has informed Kenwood that the address Kenwood has been giving out is incorrect. The correct mailing address for Kenwood is: Kenwood USA Corporation, PO Box 22745, Long Beach CA 90801-5745.

Smoking Gunns

CHUCK HOUGHTON WB6IGP called to say that those of you who are searching for Gunn diodes for 10 GHz need look no further. Chuck, the author of *73*'s ongoing "Microwave Building Blocks" series of articles, says that he has a large supply of these diodes and he'll part with them for the ridiculously low price of $5 each postpaid.

Address

WE'VE RECEIVED a request from a reader who is having trouble getting in touch with one of our authors. James L. Patterson DA1GY/KB5LF, author of "CB to Six" in the February, 1985, issue, is apparently no longer at the address listed in his article. If anyone knows his current whereabouts, please send that information to: *73* Magazine, WGE Center, Peterborough NH 03458, Attn: QRX. We'll pass it along.

Chuck Update

CHARLES E. MARTIN F/AB4Y, former *73* staffer whom we last heard from as C9ØA in Maputo, has surfaced in Paris. Chuck is editor of *The Bugle*, newletter of the Paris International Amateur Radio Association. If you're going to be in Paris, drop a note to: Chuck Martin, CPU A-316, APO NY 09777.

Keep 'em Coming

PLEASE SEND your news stories and photos to *73* Magazine, WGE Center, Peterborough NH 03458, Attn: QRX.

NEVER SAY DIE

from page 4

ago and we haven't come up with anything much of value since. Pity, for before that we were on one heck of a roll—with FM, NFM, SSB, DSB, circular polarization, parametric amplifiers, flying noise lock, SSTV, a rash of RTTY developments, moonbounce, meteor scatter, and so on. We made smoke in the 50s.

On the one hand as I tune the bands I hear you griping up a storm over the rotten QRM, bitching and moaning about the mess on 20 meters, grumbling about lists, pileups, and contests. On the other we have zillions of megahertz completely unused in our microwave bands—our 50-MHz band is almost vacant—we are using 220 MHz so little Uncle Charlie wants to give 40% of it away to the first group that asks for it. We have several technologies we could develop to greatly reduce interference on our few crowded bands—such as double sideband with synchronous detection, a technology which should allow us to accommodate about ten times as many voice contacts in a given band. Until we know more about digital voice we don't know how many contacts we might be able to squeeze using it, but the estimate is another ten times—and with much less QRM than today.

By breaking voice communications down into phonetics and using a digital code for each phonetic, the Japanese have been able to store a surprising amount of voice on a compact disc. Make a wild guess as to how many hours of voice they're able to put on a CD. Make a guess. Sorry—you didn't even come close. They're putting 14-months of 24-hour-a-day voice on one disc. Using this technology we may be able to narrow a voice band to 25 Hz. This would allow us to have 100 times as many contacts in the same band, yet with far less QRM.

About the only thing we know for sure is that we are 24 years behind in technology instead of leading it, as our rules suggest we do—and as we were doing until 24 years ago. SSB was developed by hams—was pioneered by hams—and then, after hams demonstrated what it could do, it was finally accepted by the military. That was 30 years ago—almost time to stop bragging about it.

With pulse-code-modulation (PCM) so widely used in telephones, we can easily get the PCM chips we need to see what we can do about at least moving amateur radio up into the 70s. Now they've got adaptive differential PCM (ADPCM) chips which exploit the predictive behavior of analog speech and cut the transmission rate in half. So, while voice technology is moving ahead, here we are, still grabbing our mikes, just as we did 60 years ago, and cursing the QRM. We're as stick-in-the-mud about holding onto ancient voice technologies as we are with the code. Amateur radio has become an amusing window on the past—a museum piece. Yes, horse-and-buggy communications still exist. . . just check out 20 meters—the low end for code and the high end for a caterwauling of voices. I'm looking for smoke signals around 14.250. Hey, what's that odd noise? Hmmm, might be RTTY or SSTV. . . let's jam it, just in case.

"Hey, what's that odd noise? Hmmm, might be RTTY or SSTV. . . let's jam it, just in case."

Surely, out of the almost 150,000 amateurs who we think are still even slightly active, we must have one somewhere who's been trying out some digital voice. How about it? Is there one?

How do you feel about all this? Should I stop grumbling and just tell you how great you are? How wonderful our hobby is? What a fantastic job we do in handling emergencies? How up to 25 years ago we were on top of everything? Or are you interested in articles on new technologies? Would you actually read an article on a PCM unit? On an ADPCM? I can write a lot more about digital audio tape (DAT), if you're even remotely interested. Would you prefer me to lead the orchestra as our ship sinks—or work like hell to get the pumps going? It's your call—you tell me what you want.

I think I know the answer, so I'm looking for a nice baton to wave while GE, Motorola and the other destroyers circle our sinking ship.

THE USUAL BAD NEWS

The old cliche that good news doesn't sell papers seems to guide the ham newsletters—or is it that there just isn't much good news to report?

For example, a recent *W5YI Report* included such lovely items as the Los Angeles ham who's made a career out of broadcasting obscene language over a local repeater—a ham arrested for jamming an FBI repeater—and the March licensing statistics.

The arrested ham, I'm sure all Morse-code fanatics will be excited to learn, was Extra class—further bolstering the growing concern that code makes people crazy and high-speed code makes them extra crazy. A well-known psychologist has been researching amateur radio for several years attempting to refute this proposition, but so far he has not been able to find any provable exceptions. As he said when interviewed recently, a visit to Dayton would completely convince even the most demanding skeptic.

The March FCC licensing statistics showed that amateur radio was, just before the Novice Enhancement announcement, still in a tailspin. In comparing the number of new Novices in March 1985, 1986 and 1987, the FCC figures showed that they dropped 20% in 1986 over 1985, but were down an astounding 50% in 1987 over 1986!

Well, what about Novice upgrades? 94% upgraded in 1986, while only 43% upgraded in 1987. An anomaly, right? No, it seems a consistent pattern. The percentage of Technicians who upgraded in 1986 was 84% vs. an incredible 37% in 1987. The Generals dropped from 90% upgrades in 1986 to 41% this year; Advanced was 39% this year and overall the drop was from 91% in 1986 to 41% in 1987. Got the picture?

So there you have it—the number of new licensees dropped to half of last year and the number of upgrades was only 41% of last year. Even the most optimistic Pollyannas have to admit that something's wrong.

BAD LANGUAGE

This business of insisting that the FCC define the limits of bad language is an exercise in pedantry. Just as there is no way to exactly define "quality"—there is no way to exactly pin down bad language and bad taste. Yet, like quality, we sure know it when we see it—or hear it.

Of course one of the problems involved with defining bad language has to do with the leaping upon definitions by fanatics—zealots. There's no way to satisfy a fanatic. Hell, I get angry letters from readers who object to "hell" in my editorials. They get offended by words which long ago have been admitted to family reading.

On the other end of the spectrum are fanatics who insist on exercising their so-called First Amendment Rights to make assholes of themselves on the air and, in the process, offending the hell out of almost everyone listening.

My suggestion is this—if you have someone in your community who is a consistent offender of your sensibilities, why not gather a group of the offended and visit the offendee? You'd sure get together to help some ham who needed help for some other reason—such as a handicapped ham, right? So why not get a group to work for the good of your local community?

Some hams offend us on the air as a way to get attention—others don't know any better. . . or don't care. The two hams I know of who were arrested, convicted, and put in prison for bad language on the air were both Extra-class hams, so I suppose they might have a legitimate excuse—the code made them crazy.

Fortunately most Extras can be spotted by their weird calls—and avoided. Perhaps someone should petition the FCC to make it illegal for an Extra to retain a normal call, preventing him from hiding his shame in sheep's clothing, so to speak.

One aspect which should be researched is whether the brains of Extra-class hams who lose their ability to copy code through neglect ever return to any semblance of normal. Does high-speed Morse permanently scramble the brain, or can the brain, if left alone, repair itself in time?

Continued on page 55

LETTERS

AVAST, YE HAMS

I have been active on the ham bands for ten years, never transmit obscenities, music, or business there, and am well thought of as an operator, from what I hear. There's only one problem: I don't have a license. Never have and never will.

I've been a bootlegger since I was fifteen, and I like being a bootlegger. I don't have to fool with QSL cards, I don't know a single character of Morse, and I do not have to perpetuate a fraud: that amateur radio is a public service.

Furthermore, if by chance the Rooskies or a home-grown Idi Amin takes over (yes, Virginia, it can happen here), I will not be be rounded up and shot as a potential spy or subversive. Finally, if the FCC nails me on one of my SWBCB pirate broadcasts, I have no ticket to pull.

There are a lot more like me. At least twenty percent of the people I work aren't in the *Callbook*. (Yes, I have one. And I know better than to work as W1AW, K7UGA, W6SAI, or anyone else in there.)

Let's face it: making people learn Morse these days is like requiring airline pilots to demonstrate the ability to lash the valves and time the mag on an OX-5. That's why we're bootleggers.

I am not so dumb as to believe that there are not all sorts of blue- and brown-nosers out there who would like to bust me. Somewhere out there is a League-Of-Decency type with a surplus ADF just waiting to get me in trouble—but I'm prepared. Even though I'm the very model of decorum, I never transmit from my house and I use different calls, as needed. Incidentally, I found your articles a few years back on busting jammers and other assholes quite useful.

Maybe I'll see you on 40—but don't expect a QSL card.

The Olathe Buccaneer
West of Olathe KS

It's always nice to hear that our articles are helping people out. Your assessment of ham radio's problems is largely correct—Morse code is an unnecessary obstacle to licensing and our public service responsibilities are being ignored—but whether these faults justify breaking the law is your decision. . . and your risk. However, if you're as good an operator as you claim to be, I'm not going to turn you in. —KA1MPL

SCOFFLAWS

I feel that responsible editors and publisher of ham radio magazines should 100% support lawful and legitimate ham radio operations. In a democracy, a citizen has a responsibility to obey laws and if he does not agree with them he is perfectly entitled to protest and to work for legitimate and legal changes through the system.

The word for those who do as KW1O proposed ("Have a Nice Day," Letters, December, 1986) is scofflaws. I hope that not one of our ham radio leadership will place himself above the law and promote unlawful activity.

By staying within the law ham radio has prospered over the years, and as far as I know, very few have profited by unlawful opposition to the rules of the game.

Joe Mehaffey K4IHP
Atlanta GA

KW1O went beyond the bounds of propriety in encouraging an individual to become a bootlegger, but I think that editors have a duty to write the truth as they see it, not as the law defines it. We also have a responsibility to provoke thought and promote change, when we think it is necessary. I think you left your description of a how a democracy works unfinished: If, after protests and attempts for "legitimate and legal change" fall on deaf ears, a citizen has a right and responsibility to disobey an unjust law. —KA1MPL.

PRAGMATIC IN PR

Recently there have been rumors that licenses have been sold to individuals who were not qualified to have them. Whether or not this is true, it is obvious that there are many new voices on the bands with very little knowledge of amateur radio operating procedures and customs.

In the past, most of us (myself included) have given the cold shoulder treatment to those who show interest in ham radio. Being basically lazy, we seen to forget that when we started there was somebody to help us out (WA2VCG, in my case).

Because new candidates to this hobby aren't able to find the help necessary to learn all they need to know to get a license, they are more easily swayed to take an easier route to get their license. Money.

There is always somebody willing to take a chance to make a buck. The point is that these newly licensed "candidates" are just starting out. They, too, need help to become knowledgeable ham operators. We need to help anyone, licensed or a candidate for a license, who needs help. If we don't start right now we're going to have a great big mess, which may be the end of a very interesting hobby.

Jim Meyers KP4BE
Juana Diaz PR

That's the spirit! —KA1MPL.

CHEAPSKATES

As a ham, I am appalled at the lack of response other U.S. hams have shown toward John WM4T and his call for financial assistance to help recoup the losses from his landmark legal battle with the local authorities concerning PRB-1.

It is downright shameful that a supposedly cohesive group of hobbyists known as amateur radio operators would ignore such a plea. Are so many hams willing to let someone else pay $7,000+ out of his own pocket to defend their rights? If only one ham out of every thirty contributed $1, his expenses would be completely reimbursed. Surely $1 is a small price to pay to ensure one's own rights.

John showed a lot of courage in standing up for his rights—the same rights that entitle you to operate your station. Help him out—he deserves it!

Richard Stuart WO6P
El Cajon CA

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Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0745-080X) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

NEW PRODUCTS

Santec's docking booster for their ST-20T/ST-200ET HTs.

DOCKING BOOSTER

Naval Electronics makes a Docking Booster for the Santec ST-20T/ST-200ET hand-held transceivers. The Docking Booster turns the ST-20T into a powerful mobile unit with 30- or 50-Watt output. Receiver sensitivity is also boosted through a low-noise GaAsFET preamplifier (16 dB). The booster is designed to attach quickly to most car doors and it provides connections to the car battery and the outside antenna. It also comes with mike hangup clip.

For further information, circle number 211 on your Reader Service card.

ICOM IC-900

ICOM has introduced a six-band fiber-optic mobile transceiver. The "band units" are remotely controlled via a compact control unit. The compact controller, which measures only 2.9" x 2" x 1", can be placed in any convenient location near the operator; the band units can be placed in some other spot in your vehicle (such as the trunk). The band units are connected to the controller by a fiber optic cable to eliminate rf feedback.

Among the features of the control unit are: 10 memories, two scanning systems (for memory and programmable scan), and crossband operation. Band units are available for 2 meters (25/45W), 10 and 6 meters, 220 and 440 MHz, and 1.2 GHz.

For more information on the IC-900 or other ICOM products, see your local ICOM dealer.

MINI "BEAR" CAT SCANNER

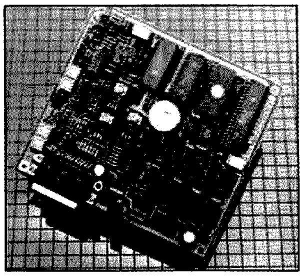
Engineering Consulting has just released The mini "Bear" Cat scanner for the FT-727R and the Commodore 64 computer. This interface allows for the programming of the Yaesu FT-727R at 4800 baud. The entire contents of the radio can be loaded in under 15 seconds. All parameters are stored and and up to ten sets of channels (ten each) can be scanned, all at once or individually. Information can be saved to disk, which allows 100 channels/disk. There is scan lock-out for individual channels, and scan speed and resume times are adjustable. All transmit and receive frequencies plus offsets and encode/decode subaudible tones can be input and loaded into the radio on command. Return data from the FT-727R provides a full-screen digital S-meter which may be used to stop the scan on preset signal strengths from S1 to S9. There is a comment field for each channel entered, and it is displayed while scanning. All information for each channel programmed (in groups of ten) is simultaneously displayed on the monitor. Once the channels are entered via the computer keyboard, the information in any of the ten frequency groups may be downloaded to the HT for portable use.

The model 727S is supplied with hardware and software to operate with the Commodore 64/64C/128/SX64 series. The hardware interface includes the circuit board, components, cables, instructions, and connectors. Assembly time is about 10 minutes. The kit is priced at $39.95.

For more information about the mini "Bear" Cat scanner, circle Reader Service number 208.

S-COM "5K" REPEATER CONTROLLER

S-COM Industries has added the "5K" to its line of repeater controllers. The CMOS microprocessor design supports both a repeater and a control receiver and requires only 60 mA at 12 V dc. Applications include control of main-site repeaters, remote receiver links, portable repeaters, and emergency repeaters.



The S-COM "5K" repeater controller.

Operating parameters are remotely programmable via DTMF commands. Data is retained in nonvolatile memory. Three logic inputs and three logic outputs are provided for site control and monitoring purposes.

Features include CW shaping, a watchdog monitor, flexible repeater interfacing, a CW clock and calendar, DTMF muting, security passwords, a "polite" identifier, transient protection, and power MOSFET outputs. Options include full IC socketing, rack-mount cabinet, wall-mount power supply, and audio delay module.

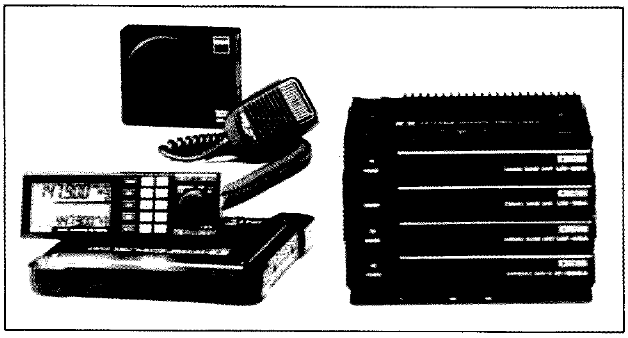
For more information about S-COM repeater controllers, circle number 218 on your Reader Service card.

QFAX-1 WX FAX RECEIVE TERMINAL UNIT

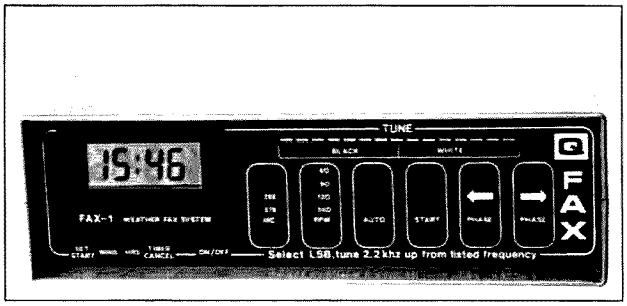
Quay Technologies has announced the QFAX-1 Weather Facsimile Receive Terminal Unit. QFAX-1 is a microprocessor-controlled intelligent interface unit designed to be connected between an SSB receiver with LSB reception and a low-cost computer graphics printer (such as Epson's FX-80 and compatibles). Operation has been made simple for the non-technical person.

The terminal unit itself is powered from 12 V dc at under 0.5 A, availing it to mobile and marine application (it comes with a mounting bracket).

For further information on this



ICOM's IC-900 6-band mobile transceiver.



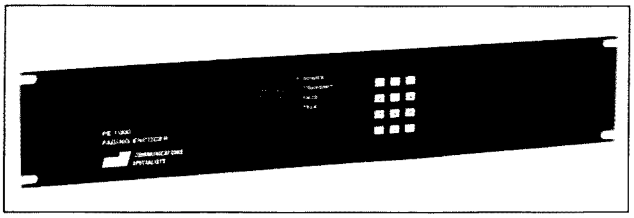
Quay's weather facsimile receiver terminal unit.

product, please circle number 207 on your Reader Service card.

CSI PAGING ENCODER

Communications Specialists, Inc., now has available a rack-mounted version of the their PE-1000 Paging Encoder. Called the PE-1000RM, this new encoder may be mounted in a standard 19" rack. Like the desk-top model, the RM is capable of 100- or 1000-call paging capacity in the two-tone sequential signaling formats. Five-tone sequential and REACH formats are also available. All features are included in every unit and are fully field-programmable through the front-panel keyboard. Programmable features include, but are not limited to, code plan and group selection, group call duration of tone and delay timing, choice of alert tones, and automatic page. A nonvolatile memory retains the programming if a power loss occurs. All standard Motorola and General Electric groups are included in every unit; non-standard tones from 250 Hz to 400 Hz may be specially ordered. An output for printing a hard-copy record of all paging activity is provided, and an automatic self-test is run each time the encoder is powered up. The PE-1000RM is available for $324.95.

For more information on the PE-1000RM Paging Encoder, please circle number 209 on your Reader Service card.



The rack-mounted paging encoder from Communications Specialists, Inc.

HL-37V COMPACT AMPLIFIER

Tokyo Hy-Power Labs introduces the HL-37V, a compact amplifier designed for 144-MHz FM/SSB hand-held and portable transceiver operation. The unit has a built-in variable-gain RX preamp which uses a low-noise GaAsFET. The HL-37V will allow you to enjoy comfortable DX QSOs by expanding the communication range limit of hand-held radios.

The front panel has a smoked polycarbonate sub-panel so that the LED lights can be recognized only when they are lit. Combined with an HT, the HL-37V will boost power to 30 W output from 2–3 W input (rf driving input of 0.5–5 W is accepted). It has a low spurious signal emission with an effective output low-pass filter. The built-in RX GaAsFET preamp allows a noisy and weak signal to be received more clearly. Gain is continuously variable from −20 dB to +40 dB. There is an LED power-level indicator on the front panel. The FM/SSB mode select switch is on the rear panel. The changeover from RX to TX has a delay of about 1 second on SSB so that the relay does not chatter.

Suggested list price is $99.95. Further information may be obtained by circling number 210 on your Reader Service card.

HF-LINK HARDWARE AND SOFTWARE

Wald-Easterday Associates, Inc., released its HF-Link line of hardware/software products which allow the amateur radio operator to control the Yaesu FT-980 and the FT-757GX HF transceivers. These new products are designed to interface with the Atari 8-bit family of microcomputers so that the user can control these two transceivers with a standard joystick, and eliminates the need of manually typing operating commands on the computer. These products also provide the user with an on-screen graphic depiction of the transceiver's operational status and include such features as: scan for memory channels at user-determined rates, rapid production and updating of station logs, unlimited storage of log and memory channel data on disk, and the use of the fire button to key the transceiver's transmitter.

To find out more about this product, circle number 213 on your Reader Service card.

ANTENNA ELEVATOR SYSTEM

Glen Martin Engineering is introducing the Hazer model H-3 for use with the Rohn 20 and 25G towers. The Hazer is an elevator system that will raise and lower an entire antenna system up and down the tower safely and conveniently. The H-4 Hazer is heavy-duty, with a wind-load rating of up to 16 sq. ft. It comes complete with all hardware, a winch, cable, and necessary brackets. Price including UPS delivery is $278. GME also supplies rotors and thrust bearings. For a complete catalog or more information, please circle Reader Service card number 219.

MIRACLE FLUX

Specially designed for soldering dissimilar metals and aluminum. This flux provides good electrical connection when soldering NiCd batteries or aluminum to copper. For mechanical strength, combine miracle flux with fluxless miracle rod.

For more information on this flux, circle Reader Service card number 215.

SUPER NiCd's FOR ICOM HTs

Periphex has released NiCd battery packs for ICOM HTs. The Super NiCd BP-7S is rated at, 13.2 V, 900 mA—double the capacity of the ICOM BP-7 for IC-02/03/04AT 5-W output. The Super BP-8S is rated at 9.6 V, 1200 mA—50% more capacity than the ICOM BP-8 for IC-2/3/4AT and IC-02/03/04AT. Both are base-charge only, with the BP-7S using the BC-35 and the BP-8S using either the BC-30 or BC-35. The price for either unit is $60 + $3 shipping.

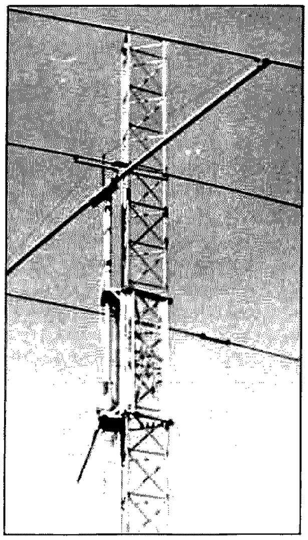
For further information on these units, please circle number 212 on your Reader Service card.

BUTANE ENERGIZED SOLDERING IRON

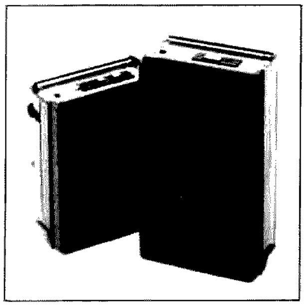
Eaglestone's butane-energized Portasol cordless soldering iron eliminates the need for battery recharging. It measures 7" long x 1/2" diameter, heats in seconds, and offers adjustable heat output equivalent to 10–60 Watts. Its 3-oz. body allows easy tip control and eliminates fatigue.

Portasol's protective cap contains a built-in igniter which, with a flick of the thumb, energizes the catalytic tip. This tip glows orange-red, does not flame, and is operational in less than thirty seconds. Non-electric, Portasol is static-free.

Filled by a butane cartridge,



The Hazer elevator system lowering a 40-meter beam.



Periphex Super NiCd's for ICOM HTs.

Portasol gives an average of 60 minutes of cordless soldering. It arrives ready-to-use, equipped with a 2.4mm tip; 1.2mm, 3.2mm, and 4.8mm tip sizes are available.

Portasol is priced at $30 plus $2 for shipping and handling. Additional tips cost $8.50 each.

For more information, please circle number 214 on your Reader Service card.

CABLE AND CONNECTOR GUIDE

Nemal Electronics International has released its Cable and Connector Selection Guide. This 36-page guide includes more than 100 new cable and connector products covering a wide array of rf coaxial, microwave, broadcast, communications, and data applications. Extensive cross-references and illustrations allow the user to easily select the appropriate cable, connector, and tooling for any application.

To find out more about the cable catalog, please circle Reader Service number 217.

73 Review

Yaesu FT-290R II 144-MHz Mobile/Portable Transceiver

Tonna F9FT 9-Element 144-MHz Portable Yagi

Yaesu USA
17210 Edwards Road
Cerritos CA 90701
Price Class $580

by Peter H. Putman KT2B

Tonna Antennas imported by:
The PX Shack
52 Stonewyck Drive
Belle Meade NJ 08502
Price Class: $60

Photo A. The Yaesu FT-290R II configured for mobile operation with the FL-2025 amplifier.

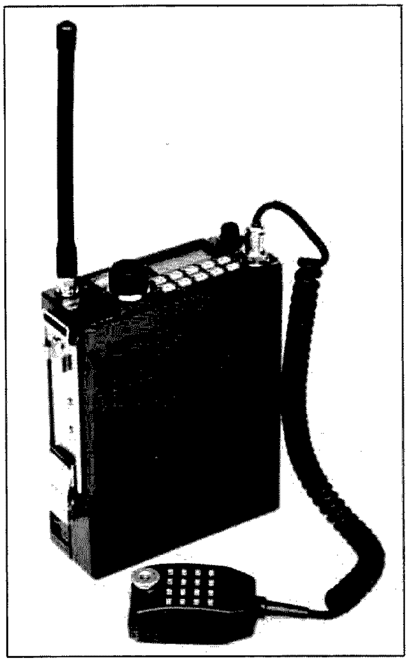


Photo B. The FT-290R II configured for portable operation with a rubber duck and an FBA-8 battery pack.

This review is dedicated to all of those jaded two-meter operators who've reached the end of their ropes and think the thrill is gone on 144.200 MHz. Surprise! I've come to tell you that the thrill is back (and then some)!

The Yaesu FT-290R II multimode transceiver offers base/mobile operation with 25 Watts and portable operation with 2.5 Watts. The Tonna 9-element 144-MHz portable yagi requires no tools to assemble and breaks down in minutes for easy transportation. Together, they make a very compact and efficient station, ideal for mountaintopping, portable/emergency operation, or just lying in a hammock and making a few SSB contacts while sipping a cold drink. Here is a package that weighs in at less than 10 pounds and offers full two-meter communications flexibility . . . portable packet, FM, CW and SSB DX, and of course repeater operation.

The FT-290R II

We'll start with the FT-290R II, but first a little historical background is in order. Many readers no doubt recall the earlier FT-290/690/790 series radios. These nifty units ran about 3 Watts output on FM/CW/SSB, with 10 memories and a self-contained battery pack. They made their appearance in the U.S. market in the early 1980s but didn't seem to sell all that well here (based on conversations I've had with Yaesu dealers). I'm not sure why, because they offered a very nice combination of power to weight as well as long battery life.

At the same time the radios sold like hotcakes in Europe! In fact, I saw an ad last year in the RSGB magazine which claimed that ". . . the FT-290 is the most popular 2-meter radio of all time." There must have been a reason for it, and that reason became obvious shortly: Grid Squares. Yep, stations in Europe

> *"The Tonna is designed to be assembled with the most common tool on the face of the earth: fingers."*

were buying 290s and 790s (for 70 cm) and going grid square hopping. 290s were also finding favor as low-power mobile stations; many accessory amplifiers were bought for this purpose.

Times have certainly changed on this side of the Atlantic—grid squares have become the rage, and so it would seem that the U.S. market is wide-open for small portable VHF transceivers. Yaesu must have been thinking the same thing, and it didn't take long for the ads for the 290R/690R to catch my eye. Being one of those incorrigible backpacking VHF types, I knew I had to get one to review soon. (And Yaesu was more than happy to oblige me, sending along one of each and a few battery packs as well!)

There are several different ways that the 290R II is shipped, but I assume my sample was representative: It came with the core radio/control head, heat sink/power amplifier module, dc power cord, and mobile bracket. I also received a rubber duckie antenna with the basic package—it wasn't immediately useful and I'll touch on that momentarily. With this setup, you're ready for 25 Watts of SSB/CW/FM operation from your car or base station. The heat sink/power amplifier combination snaps on with two latches to the back of the control head assembly (see Photo C), and the dc leads are attached to a suitable power source.

An RCA plug delivers low-level rf of about 2.5 Watts to the final amplifier. Three gold-plated contacts deliver control voltages and sample the ALC level, and a screw post depresses a spring-loaded switch to keep the front-panel light on while in use. The contact mechanism appears to be very solid and reliable, and the two spring latches on either side

Photo C. View of the modular connections between the control unit and the power amp (shown) or battery pack.

ensure a positive locking fit. You just make your antenna connection (standard S0-239), apply 13.8 V dc at about 5 Amps, and away you go!

Back to that duckie. The FT-290R II is easily configured for portable operation by removing the heatsink assembly and snapping on the accessory battery pack (FBA-8) which will hold 9 NiCd or alkaline cells, depending on your preference. You then install the duckie antenna or other antenna of your choice to the front-panel BNC connector. But you don't get the battery pack with the radio! It is an optional accessory. So why include the rubber duckie? (Unless you want to take a motorcycle battery and operate a real heavy-duty QRP station. Of course, once you've purchased the FBA-8, things work very well with the rubber duck. Things work even better with a quarter-wave antenna, and best of all with a beam. But I'm getting ahead of myself.)

The control layout of the FT-290R II definitely falls into the "simple" category, as Yaesu went light on bells and whistles. Basically, you have controls for volume, squelch, clarifier (RIT), and a big tuning knob. There are also several dual-function push-buttons to select the two vfo's, any of the ten memories, the desired mode, repeater offsets or simplex operation, high or low power, priority channel, and scanning operation. With these controls, you can program independent mode, offset, and frequency information into any channel.

The front panel has definitely been "human engineered," as the largest controls are the ones you use most often–volume, squelch, and tuning/memory select. The display is a soft green, but the bulb intensity leaves a bit to be desired in mobile operation. Incidentally, the bulb switch is not engaged when the battery pack is snapped on, so as to prolong battery life. If you need to engage the switch momentarily, or even lock it on, you can do so with a recessed twist-switch on the battery pack. Good thinking, Yaesu.

Now, with the battery pack in place, you have a radio weighing about 4 pounds which sizes up at roughly 6" wide X 7 3/4" deep X 2 1/4". Small enough for you? Incidentally, the sizes are the same with the power amplifier assembly. Speaking of the power amplifier, here's a neat twist: You can attach four screws through the back of the mobile bracket and attach it to the heat sink/amplifier permanently. Then, just release the two side latches and snap on the battery pack when you arrive at your portable location. When finished, remove the battery pack and slide the control head back into the mobile bracket and reattach the latches. Piece of cake!

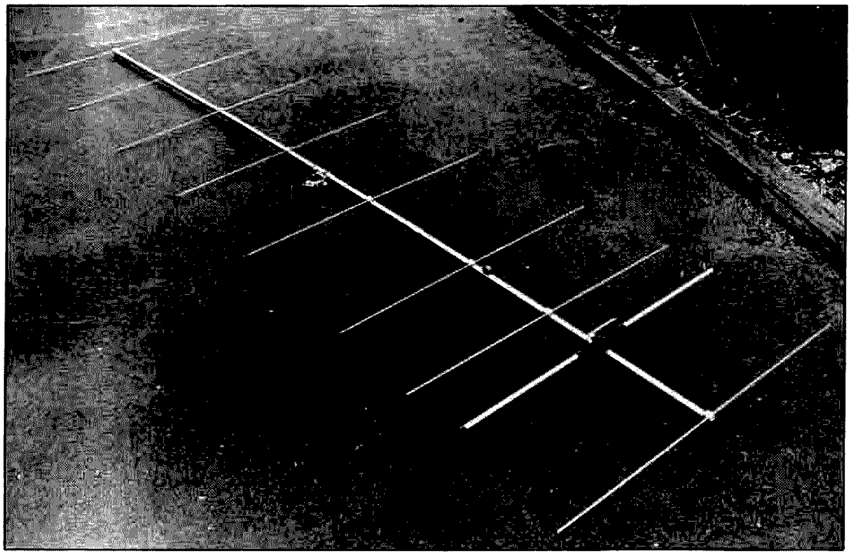


Photo D. The Tonna 9-element portable 2m antenna fully assembled. Note the T match and the square-boom construction.

FT-290R II PERFORMANCE MEASUREMENTS

Specification	Claimed	Measured
Minimum Discernible Signal	n/a	−130 dB
Sensitivity		
10 dB S/N	.2 uV SSB/CW	.25 uV SSB/CW
12 dB Sinad	.25 uV FM	.25 uV FM
Squelch Law		
SSB/CW	n/a	.2 uV
FM	n/a	.2 uV
Selectivity, −6/−60 dB		
FM	12/25 kHz	15/25 kHz
SSB/CW	2.4/5.2 kHz	2.5/6 kHz
Sensitivity "S9"	n/a	5 uV, SSB/CW/FM
Power Output (W)		
w/FL-2025 amp	Hi 25/Lo 5	Hi 25/Lo 5
w/FBA-8 & NiCds	Hi 2.5/Lo n/a	Hi 2.8/Lo .4
Current Drain (A)		
w/FL-2025	Hi 8 max.	Hi 6
	Lo n/a	Lo 3
w/FBA-8	Hi 1.1	n/a
Receiver Current Drain (mA)	80	120

Let's take a look at the front-panel controls again. There are ten of them–nine main controls and a yellow shift button. The VFO key toggles between vfo's A and B, while with the shift control this key initiates a programmed memory scan between band limits defined in memories 1 and 2—exclusive of mode. The key marked MR enables the ten-position memory selection. Shifted, it actuates a selected memory channel as a priority channel while in the vfo mode. A key is provided for large frequency stepping up or down using the shift key. Repeater offsets of −600 or +600 kHz are provided, or you can split the vfo's for an odd offset with the RPT swtich. The STEP key determines tuning speed (typically 25, 100, or 2500 Hz in SSB/CW; 5, 10, or 20 kHz in FM). Shifted, it chooses low or high power, low being typically about one-tenth of high.

Finally, a REVERSE key is provided for listening on repeater inputs. This key also actuates the optional FTS-7 Tone Generator Unit. The MODE key is self-explanatory; when shifted, it turns the noise blanker on and off. The last key is the MEMORY IMPUT key, used both when programming and when setting the "skip-scan" feature up (wherein selected memories can be locked out of scan mode).

So—now that I had this nifty transceiver all loaded up with fresh batteries, I needed three things: (1) A contest. No problem there as I opted to try out the FT-290R II during the ARRL 144 MHz Spring Sprint on April 13. (2) A good location. Again, no problem. I settled on the Catfish Fire Tower near Catfish Pond in the Kittatiny Mountains of western New Jersey, about 1500 feet ASL. (3) A portable antenna. This looked to be a problem as I was growing weary of tearing my 4-element KLM yagi apart and reassembling it over and over again! (So was the antenna!) However, help came from a nearby source, as Ivars Lauzums

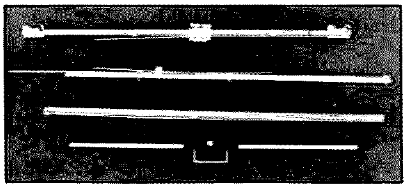


Photo E. The Tonna breaks down into a neat package—the only tools needed for assembly are your fingers.

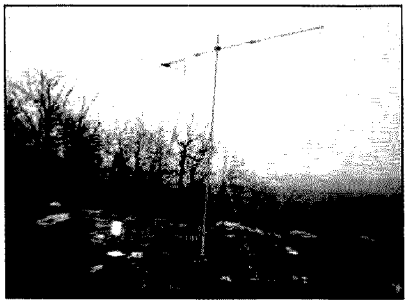


Photo G. The portable station setup at 1500 feet—the moon is rising in the east.

KC2PX of the PX Shack offered the use of one of his Tonna 9-element portable yagis, model #20089.

The Tonna

This unassuming antenna is designed to be assembled with the most common tool on the face of the earth: fingers. Clever selection of boom stock and element material has resulted in a high-gain lightweight yagi for virtually any use on 2 meters. The elements have two notches on them–one at the end and one in the middle. The latter serves to center the element before you secure it to the boom. The former keeps it from falling out of its retaining clip when you collapse the yagi for portable operation.

Tonna employs the same feed system as is used on their 13- and 17-element yagis with a T-match sealed in plastic. A type N connector is standard and a decoupling sleeve is provided which also secures the coaxial cable feed. Assembly time is extremely short—20 minutes if you work methodically, 10 if you don't. Broken down it takes up very little space, with three sections and the driven element all fitting inside a canvas tent stake bag about 3 feet long. The disassembled antenna is shown in Photo E. Incidentally, the three boom sections are coded with both green tape and an inked-on arrow to indicate the correct mounting direction when reassembling.

Tonna claims an isotropic gain of 13.2 dB for this antenna, with the front-to-back ratio specified at 19.8 dB. This latter figure is about what I expected for a 9-element yagi. (The assembled boom length is 11.5 feet.) The −3-dB beamwidth is also fairly broad at about 40 degrees. The F/B ratio is tolerable for contest mountaintopping (considering the weight and ease of assembly). Remember that strong local signals running high power can be your biggest problem when you're mountaintopping—this is especially a problem here on the East Coast. (I could have sharpened the front pattern up a bit by stacking two of these, but would have the extra weight and masting to contend with—not worth it.

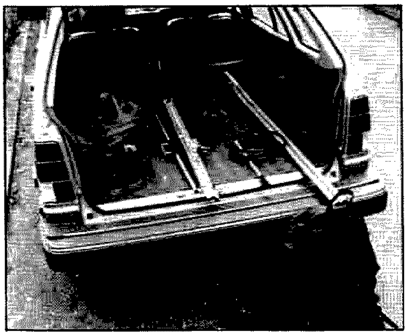


Photo F. All loaded up and ready to climb—the radio is inside the backpack.

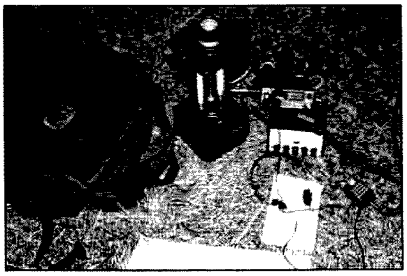


Photo H. Close-up of the operating position.

The boom material is the same as used on the 9-element conventional Tonna yagi, but the clamps are different for the elements. I couldn't see a real problem with using the antenna permanently; the brackets appeared to be plenty strong enough.

As mentioned earlier, you only need fingers to assemble the yagi, but keep a 10mm wrench handy to attach the beam to the mast of your choice. The supplied brackets will accommodate up to 2" mast material. I opted for the lightest, cheapest TV masting around—20-gauge 5-foot sections from Radio Shack. (Remember, the point here is to save weight whenever possible!) Using my time-tested low-profile anchor and lightweight 1/8" nylon rope, I was able to come up with a very portable mast arrangement weighing under 10 pounds.

Up, Up, and Away

And off I went with the FT-290R II, a keyer, logbook, fluorescent lantern, canteen, and two 5' pieces of TV masting. A few odds and ends in the pack rounded out the list, including my camera, some snacks, and extra warm clothes for the mountaintop. I decided to get a warm meal before tackling the climb, which straddles the Appalachian Trail. The mediocre weather conditions earlier in the day showed signs of improvement as I headed west, and the sun broke through as I arrived at the trailhead at 7 p.m.

It took about 15 minutes to load up the equipment and backpack, and the hike to the top was accomplished in 20 minutes. I killed another 20 minutes or so setting up the antenna, baseplate, and guy ropes. The entire installation appears in Photo G, with the moon rising to the east. Photo H shows the guts of the station—FT-290R, MFJ keyer, lightweight phones, clock, camp light, and a ground pad to park my rear end on.

At 8 p.m. KT2B/2 QRP burst onto the airwaves with an astounding 2.5 Watts, being careful to stay away from 144.200 MHz so as to improve the chances of making contacts through all that QRM. By 8:30 p.m. I had worked 15 stations in 4 grid squares–not a bad rate for QRP! The temperature was dropping rapidly as the cloud cover moved away, making for spectacular and chilly views of the moon rising. I put on a few more layers of clothes and dug in, working 32 contacts and 6 more new grids during the next hour. Reports were spectacular! Everyone liked the audio quality (many refused to believe I was running anything less than 100 Watts) and signing "...portable QRP" brought more than a fair share of quick replies.

I finished my last hour of participation with a flourish, bagging 19 more QSOs and 3 additional grids, including a 400+ mile QSO with VE3ASO in FN15 (central Ontario) on SSB! (That ought to convince skeptics of the potential of QRP on VHF.) I should add that conditions were average. No enhancement was observed from my mountaintop QTH. I wound up making all of my QSOs on SSB, as I had to wear gloves due to the cold and couldn't operate the built-in microswitches on my keyer accurately. Despite all of this, I finished with 66 QSOs and 13 grid squares.

It was a simple matter to break everything down; the antenna came completely apart in about 10 minutes. I stuffed everything into the backpack and slid the antenna sections into slots on my pack used for cross-country skis. On the way down the path, I did have a problem with elements sliding out and hitting my legs or the ground, hence the suggestion to secure the elements with rubber bands. When I arrived at the car I detached the battery pack inserted the control head back into the bracket, locking up with the power amplifier module. Presto! Back on 2-meter FM mobile for the trip home (and an occasional SSB contact here and there).

Now, that is truly a painless operation. You could travel lighter than I did, but I've gotten used to 30–40-pound packs with extra support gear in them when I hit the hills. This setup would lend itself well to the summer contest schedule, especially during the ARRL June and September VHF QSO Parties (where a separate QRP entry exists) and the *CQ* World-wide VHF WPX in July (also in the QRP or Portable classes). The trick here is to use a good gain antenna with your QRP signal, and the Tonna fits the bill perfectly. (By the way, for those of you who are REALLY ambitious, Tonna also makes a 13-element version of this antenna, they claim 14 dB gain and 27 dB F/B ratio on a 14-foot boom.) You should also use the lowest-loss coaxial cable possible. RG-8/X works surprisingly well in short runs, and represents a good balance between weight and signal attenuation. Remember, the total feed-line run from the 9-element yagi on a 10-foot

mast is less than 20 feet. RG-8 works somewhat better *if you don't mind the added* bulk and weight.

In the Lab

Finally, the bench test results. I was very impressed with the front end on the FT-290R during actual operation, especially during pileups near and on 144.200 MHz. (Yes, I actually ventured onto the calling frequency, which is like riding the interstate on a bicycle during rush hour!) The usual measurements were taken, excepting dynamic range and compression point. It would appear that the latter figure is in excess of at least 0 dB, based on observations in the field.

The hysteresis in the squelch circuit is a bit spongy, and it takes almost as much signal to open it in SSB/CW mode as it does to produce 10 dB S/N ratio. A similar situation existed in FM, and in fact many times the squelch will not open when no signal is present, even if the control is set to absolute minimum sensitivity (e.g., no squelch) while in the FM mode. On the other hand, it doesn't take much signal to open it at that point, so it isn't a problem.

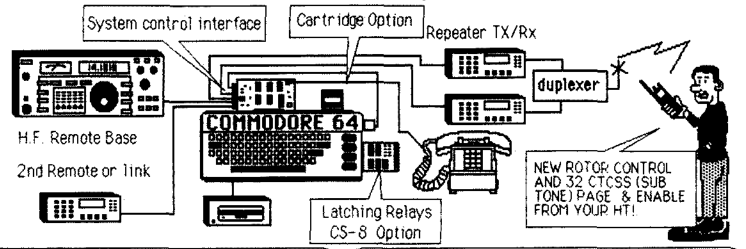
I wish the lamp was a bit brighter on the display, especially *when* mobiling at night. Compared to the FT-290R, my Alinco ALR206 display looks like a neon sign on Broadway! I suspect this is a result of trying to save current drain on the batteries when the lamp is used. The 1-Watt audio output stage may be strained a bit if you operate in a noisy environment, but in discussions with Yaesu this again is a function of current consumption and speaker size. I just keep the volume control up to 80% of maximum setting while mobiling and that works fine.

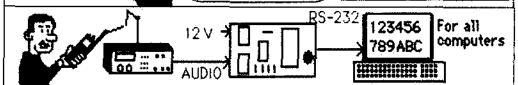
Conclusion

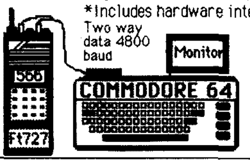
No doubt about it, Yaesu has a winner here. I haven't had this much fun on VHF in years. The combination of a mobile radio and portable shoulder-slung radio all in one package makes it hard to beat, and the receiver performance is better than average for the design. The choice of C cells for the battery pack will result in longer operating time (I took two packs for the 144 MHz Sprint and barely exhausted one of them in 2-1/2 hours) and that means you can have more fun sitting on mountaintops at night in cold weather trying to work rare grids like I did! *Seriously, the* battery life is probably on the order of 4–6 hours per pack, assuming about a 25% duty cycle (SSB/CW).

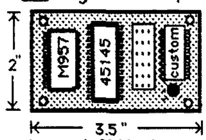
The Tonna 9-element 144-MHz portable yagi makes the perfect companion for the FT-290R, owing to its extremely light weight, strong boom construction, and simplicity of assembly. Its front-to-back ratio and gain figures are more than adequate for the simple QRP station, and the sealed, pretuned driven element is sufficiently broadbanded to cover all of the 144-MHz band with better than 1.5:1 vswr.

For more information about the FT-290R II, circle number 203 on your Reader Service card; for more information about the Tonna 9-element yagi, circle number 204 on your Reader Service card. ■









The SuperSCAF From AFtronics

AFtronics, Inc.
PO Box 785
Longwood FL 32757-0785

by Jim Thompson W4THU

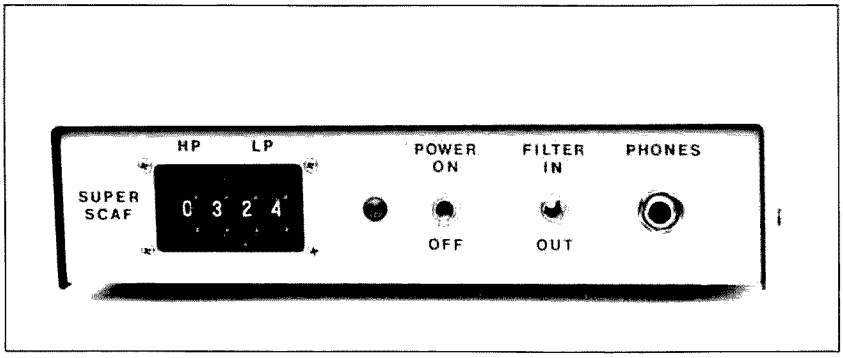


Photo A. The SuperSCAF from AFtronics.

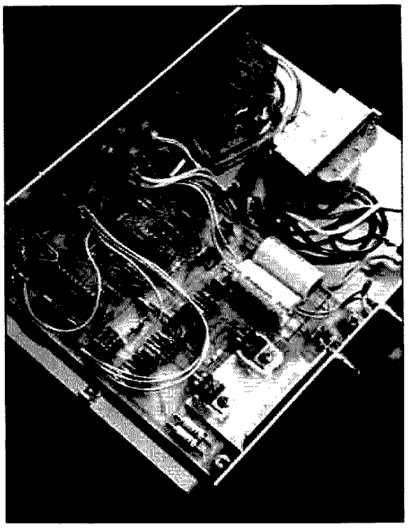


Photo B. Inside the SuperSCAF.

Present-day receivers offer a diverse arsenal of weapons for fighting QRM. Synthesized, multiple-conversion receivers feature distributed selectivity (multiple filters at different i-f frequencies), excellent gain distribution, low noise, high dynamic range, unwavering stability, variable bandwidths, passband tuning, slope tuning, variable bfo's, i-f notch filters, noise blankers, instant QSY, and QSK. All of this sophistication might lead you to expect little help from external accessories. The central question of this review is: "Can an outboard audio filter help a modern quality HF transceiver?"

Advances in Audio Filter Technology

Audio filters or processors have come a long way. The day of the simple LC circuit is gone. Filters using banks of operational amplifiers and closely matched components may be breathing their last breath. Gone, too, are many of the problems that reduce the usefulness of most conventional audio or baseband filters. The "ringing" and monotone monotony, long trademarks of narrowband audio filters, are being eliminated. Digital techniques are now being used in audio filtering and processing.

The SuperSCAF, available from AFtronics, Inc., is one such digital audio processor. A SCAF is a "Switched-Capacitor Audio Filter. The SuperSCAF contains none of the components usually found in audio filters. There are no coils, op amps, or precision-matched components. The SuperSCAF has an over 150 dB/octave rolloff. It also has a 50-Hz-wide filter to effectively cope with a busy CW band or pileup. If you want to find out more about how these filters work, refer to the article in the April, 1986, issue of *QST*. The article was written by Rich Arndt and Joe Fikes, who head up AFtronics, Inc.

Building The SuperSCAF

It would be unfair for me to say that this kit is for everyone. You need to be comfortable using a low-wattage soldering iron and working with solid-state components. If you are new to kit building, I would suggest practicing on a scrap printed circuit board. Anyone who is willing to take the time to follow the instruction manual carefully should have no trouble completing the kit.

You will have to make your own cable to connect your receiver to the SuperSCAF. The input connector is a phono jack. The audio output from the SuperSCAF is available from both the front and rear panel. A built-in audio amplifier has more than enough power to drive any headphones or speaker.

One feature that is missing is the ability to accommodate headphones with stereo phone plugs. This includes stereo headsets and Heil headphones, among others. You can overcome this problem with a mono-to-stereo adapter. You could also replace the SuperSCAF's single-circuit jack with a two-circuit "stereo" jack. The latter would be my choice. Plastic bags hold most of the kit's parts. If you cannot identify all of the parts, take the time to become really familiar with each component before you begin construction. Several pages of the manual are devoted to parts identification and proper soldering techniques. This is a two- or three-evening project. The instruction manual is a real hand-holder and will carefully guide you through the PC board maze.

Switch-Selected Filter Response

The SuperSCAF provides separate low-pass (LP) and high-pass (HP) filters. Each is independently adjustable, and together they produce a bandpass response. The cutoff frequencies of each filter are switch-selectable in 100-Hz increments from the front panel. For example, dial up "03" on the HP thumbwheel switch. The filter passes only frequencies above 300 Hz. Select "05" on the HP thumbwheel and only frequencies above 500 Hz will pass through unattenuated. Select "30" on the LP thumbwheel and only frequencies lower than 3000 Hz get through the filter. Since the LP filter was left set at 500 Hz, the SuperSCAF is now functioning as a bandpass filter with a nearly flat response from 500 to 3000 Hz. Above and below these selected frequencies, signals disappear quickly. If you prefer less high-frequency response, simply dial some lower number on the LP thumbwheel switch. If you dial "20", for example, the filter response will be 500 to 2000 Hz.

A Super CW Filter?

An inherent calibration error exists in the SuperSCAF's HP filter. The HP cutoff frequency is actually about 10% below the frequency indicated on the thumbwheel. I suggest taking advantage of this error to create a narrow bandpass filter. For example, if you dial in "04" into the HP thumbwheel, and "04" into the LP thumbwheel, the 10% error results in a filter that is only 40 Hz wide, centered on 380 Hz. Dialing in "07" into the HP and LP thumbwheels will give you a 70-Hz filter bandwidth centered near 675 Hz. However you set the thumbwheels, just remember to take into account the calibration error in the HP filter if you want to accurately figure your bandpass. The skirt selectivity is better than the CW crystal filter that is in your rig.

Critical Listening

Two transceivers, representative of a wide range of transceivers, were used to test the SuperSCAF. The primary transceiver was a Kenwood TS-930S. The first thing that I noticed is that the SuperSCAF, when in the "filter out" mode, was not as quiet as the audio system in the TS-930S itself. Switching the SuperSCAF to "filter in" eliminates the problem. Unfortunately, the SuperSCAF's own audio amplifier is always in the circuit. My preference is to completely bypass the SuperSCAF's circuits when the filter switch is in the "out" position.

The results were excellent. Reducing the LP cutoff frequency can really cut out interference from nearby stations. The effect is similar to using the slope tuning controls on the TS-930S, but with somewhat better rolloff characteristics.

To fully appreciate the SuperSCAF, you must use it on CW, where you take fuller advantage of the narrowband characteristics. A filter with a 40-Hz bandwidth can be a real help when the QRM gets serious. With the SuperSCAF, it's a case of "now you hear him, now you don't." It's surprising how much space exists between CW stations. To use this order of selectivity, your receiver must be absolutely stable and should have a slow tuning rate. Another curious characteristic is the improved signal-to-noise ratio that the narrow bandwidth provides. It seems easier to dig signals out of the mud.

The results with the TS-820S were similar to those from the the TS-930S, except for its own constant background hiss. Using the SuperSCAF with a moderate bandwidth ("0330" dialed in on the thumbwheels) improved this nicely. Many of the filtering features now standard on newer transceivers were not available on the TS-820S.

The project was easy to put together, and everything about it is first-class. The only problems I found were the "filter in/filter out" switching scheme with its resultant background noise and the mono-only jack.

The filter's skirt selectivity is excellent and the thumbwheel adjustment of frequencies is very convenient. There is a worthwhile CW selectivity improvement, and improvement on SSB, as well. The SuperSCAF is an effective new weapon in the battle against QRM.

For more information, circle Reader Service number 239. ■

73 and ICOM present the

Golden Gigahertz Contest

JULY 13–14

ICOM America and *73 Magazine* proudly present the first annual Golden Gigahertz Contest. This 1.2 GHz contest will be held from 0001 UTC July 13 through 2400 UTC July 14. ALL ENTRANTS WILL RECEIVE A FREE HAT AND T-SHIRT COURTESY OF ICOM.

Official Rules:

Operating Categories: Single operator; multi-operator, single transmitter.

Frequencies: Contest frequencies are 1260–1300 MHz. However, because of the large size of the band and the nature of microwave communication we suggest that you check **1294.500 MHz** (the national FM simplex calling frequency) and **1296.100 MHz** (the national SSB/CW weak-signal calling frequency).

Modes: If it's legal on 1.2 GHz, it's valid for the GGC.

Exchange: Grid square and signal report. (Grid locators are available from ARRL HQ.)

Scoring: Multipliers are grid squares. Repeater contacts count to increase QSO total but do not count as multipliers. Total Score = (Total QSOs x 5 x Multipliers) + Repeater Contacts + Repeater Grid Squares. (See the entry form for more information.)

Forms: Please fill out the attached coupon to receive your official Golden Gigahertz entry form/log sheets. **PLEASE BE SURE TO INDICATE YOUR T-SHIRT SIZE AND LICENCE CLASS ON THIS COUPON.** Mail the coupon to Golden Gigahertz Contest, ICOM America, Inc., 2380-116th Ave. NE, Bellevue, WA 98004.

Entries: Mail your completed log sheets to **Golden Gigahertz Contest, *73 Magazine*, WGE Center, Peterborough, NH 03458.** Entries must be postmarked by August 31, 1987. Results will be printed in *73 Magazine*. Decisions of the *73 Magazine* Contest Committee are final.

Please send me my Golden Gigahertz log sheets and my free hat and T-shirt.

Name: ____________________ Call: ____________

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City: ________________ State: ______ Zip: ____________

Circle T-Shirt Size: Small Medium Large X-Large

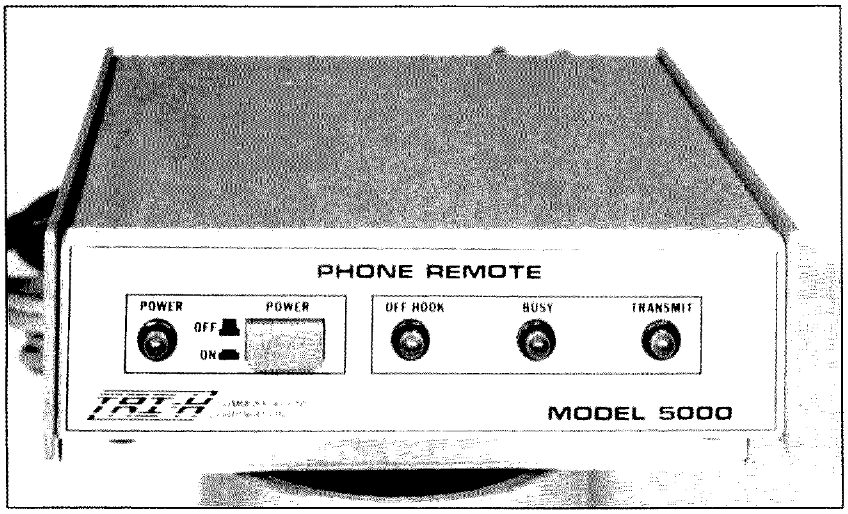
Circle License Class: Novice Technician General Advanced Extra

Mail to: Golden Gigahertz Contest, ICOM America, Inc.
2380-116th Ave. NE, Bellevue, WA 98004

Phone Remote 5000

by Jim Godron N1EJF

CES
803C S. Orlando Ave.
Winter Park FL 32789
Price Class: $200



The Phone Remote 5000 is a small device that allows you to connect any HF, VHF, or UHF radio to a touchtone™ telephone. The Phone Remote is not a phone patch and it doesn't allow your mobile station to originate a phone call. It allows you to operate your base radio on a preset frequency via the telephone when you're away from home. The Phone Remote doesn't allow you to control any transceiver function other than transmit and receive. Activity and push-to-talk timers are provided in case the phone connection is lost.

The Phone Remote 5000A is a small unit, about 5-3/4" x 6-1/2" x 1-3/4". The front panel contains a power switch with indicator LED and three status LEDs marked OFF HOOK, BUSY, and TRANSMIT. There are four cables coming from the rear of the unit. The phone line is terminated in a standard modular jack and can be plugged into any phone plug or "T" adapter. The power line is a 2-conductor cable which is connected to 12 V dc and ground. When the external speaker line is connected to an external speaker, the Phone Remote will route the audio to the speaker when the Phone Remote is not in use, and mute the speaker when the remote is in use. The last cable is a four-conductor mike cable. A suitable mike cable connector for your radio must be wired for ground, PTT, and mike audio.

> ***"The Phone Remote allows you to operate your base radio on a preset frequency via the telephone when you're away from home."***

Programming

The first thing to be programmed is the ON/OFF code. When the code is pressed on the telephone touch pad, the Phone Remote unit will be turned on and off. The ON code is * followed by two digits; the OFF code is # followed by the same two digits. A truth table is provided to make the setting of the 8-position DIP switch very easy. This code prevents unauthorized use of your radio.

A ring counter is programmed so that the the Phone Remote unit will pick up on 1, 2, 6, or 10 rings. If the Phone Remote is on its own line, you may want to leave the unit at its factory programming of 1 ring. If the Phone Remote shares your home line, a 6- or 10-ring setting will let you beat the unit to the call.

The PTT timer determines how long any one transmission can be. If the phone connection is lost, the time set will be the maximum time before the unit drops out. The timer can be set for one, two, three, or four minutes.

The activity timer tells the Phone Remote how long to remain connected to the phone line in the event that there is no activity on the touchtone pad. The unit will beep 30 seconds before it disconnects. The available times are 3, 5, 10, and 15 minutes.

Operation

The operation of the Phone Remote couldn't be simpler. If your transceiver is turned on, tuned, and ready to operate, all you have to do is dial the number that the phone remote is connected to. When the unit answers, you'll hear a *beep*. When you enter your ON code you'll hear the receiver audio. To transmit, key the * button. To receive, key the # button. Use the * and # buttons to switch between transmit and receive during the QSO. When you're done, enter your OFF code and hang up. That's all there is to it.

Conclusion

The unit that I tested functioned perfectly. Because I have two phone lines in my shack, I was able to hook the unit to one line and call it from the other. This arrangement allowed me to be present at the radio while I evaluated the unit. The unit is designed to be operated without a control operator physically present at the station, so care should be taken in deciding how the unit should be used. The Phone Remote should provide years of service.

For more information, circle number 205 on your Reader Service card.■

Stone Mountain Engineering QSYer

Stone Mountain Engineering Company
PO Box 1573
Stone Mountain GA 30086
Price class: $90

by Bernard C. Herring Z21EI

The QSYer from Stone Mountain Engineering.

The Yaesu FT-757GX transceiver was introduced toward the end of 1983 and provided a number of attractive features in a small size. Highlights were a 100-Watt output on all HF amateur bands, provision for computer interfacing, dual vfo's, and scanning and memory systems. In addition, several items, normally options, were included in the package.

Taking into account the reasonable price, it was not surprising that the FT-757GX attracted good reviews in the amateur press. But one criticism came up every time—the tuning rate is too slow. Typical comments were: "The tuning rate can be a bit of a pain," "A QSY of 250 kHz [is] somewhat laborious," and "Frequency changes [are] a tedious business."

Well, I have been a Yaesu fan since the first FT-101, and who needed to QSY that fast, anyway? So I bought one, and a while later sat back, looked at the tuning knob, and thought, "What this rig needs is a keypad."

To banish any charges of bias, I had acquired a Sony ICF-2001 general-coverage receiver a year or so before buying the 757. This Sony product relied entirely on keypad frequency entry, allied with UP, DOWN, and FAST buttons. It wasn't long before I sat back and thought, "What this receiver needs is a tuning knob."

I don't know the lead time between concept and production of a radio, but both Sony and Yaesu have recently produced later models employing both tuning knob *and* keypad. Maybe telepathy works!

FT-757GX owners don't have to look at new models to solve the keypad problem. A smart little device—the QSYer from Stone Mountain Engineering—will give them instant QSY facilities from 500 kHz through 30 MHz.

The tuning knob retains its use for band-searching, but if you want a spot frequency fast, the QSYer will find it for you in less time than keying up a phone number. In fact, the QSYer employs a standard telephone keyboard of 10 alphanumeric keys plus two control keys designated by a star (*) and a pound sign (#). The number keys enter numbers, the star is used as a decimal point, and the pound key transfers the numerical value of the frequency to the 757 digital readout. That's the *slow* way of entering frequency.

The QSYer thinks for itself, and between 3 and 30 MHz it will place the decimal point correctly without using the decimal key. Leading and trailing zeros don't have to be entered either, so 14.2 MHz is entered as 142#, and the 757's digital display will show 14.200.0. The tuning knob can be used to shift away from any frequency entered by the QSYer. Frequencies below 3 MHz *do* require use of the decimal key: 1.8500.0 would be entered as 1*85#.

Physically, the QSYer is housed in an aluminum box only 3-1/2" deep, 3" wide, and 2" high, finished in baked enamel that matches the 757 color scheme. The top of the enclosure, on which is mounted the light gray plastic keypad, slopes at 10° just like a normal telephone keyboard.

A 42" cable connects the QSYer to the rear panel of the FT-757GX. The cable terminates in two plugs: One connects to the data input port on the 757 (marked REMOTE) and the other to the +8-V-dc or the +13.5-V-dc jack. If connection between the 757 and the QSYer takes longer than 30 seconds, you're spending too much time drooling over the joys to come! But, exercise care with the plug connection to the remote jack—the pins in the jack are easily bent! Once connected, the QSYer is ready for immediate use, and you'll wonder how you ever got along without it.

There are some useful bonuses with the QSYer. Frequency changing for the blind op is a snap; the long connecting cable allows the keypad to be placed where it suits your operating convenience.

Second, keypads that are built Into transceivers are vertically mounted and the keys have to be "poked." The QSYer keys are "pressed," so you can avoid marking up the keys with your fingernails.

And, for the musically minded, each of the number keys on the QSYer "bleeps" when it is pressed. These bleeps are on a rising scale from 1 to 0. The scale is near enough to the tonic sol-fa to play simple tunes—or even to compose!

Any gripes about the QSYer? I don't think so. The price is right, and the installation guide is a model of clarity. Maybe a schematic of the circuitry could have been included, but there's not much more than a single microprocessor anyway. That's the QSYer. Try it—you'll like it.

For more information about the QSYer, circle number 201 on your Reader Service card.■

Torrestronics Universal Digital Frequency Readout

Torrestronics, Inc.
4850 Hollywreath Court
Dayton OH 45424
Price class: Kit $100
Assembled $135

by Adam W. Weiss WA1WMZ/2

Photo A. The "listening area" at WA1WMZ/2. The Torrestronics digital display is the box at the lower right.

Owners of rigs with analog dials, when asked about the efficiency of digital readouts, usually respond with: "Anyone who can't read an analog dial doesn't have the mental agility of a well-used handball" and "They're safer; they won't go dead on you" and "Everybody knows that it'll cost you a fourtune to update" and "They've got no soul at all" (I have to admit some feeling towards that one). Digital displays are, in fact, easier—especially after a long day. Face it. It's a lot more efficient to be told, in effect, where you are rather than having to ask yourself, "OK, where am I?"

Along with enjoying ham radio, I'm an avid shortwave listener and own, in my opinion, one of the finest "most for your money" receivers made—the Yaesu FRG-7. I've made several modifications to it over the years and truly love it. It is definitely one of Yaesu's better efforts to combine quality and pricing. The only thing that has bugged me over the years is that it is now one of the few pieces of radio gear that I use on a constant basis that isn't digitized. Making it was the perfect final touch.

There are many widgets out there that can do the job, but the Universal Digital Frequency Readout by Torrestronics, Inc. (a family company run by Al Torres KP4AQI), is one of the nicest examples of such. It is sold in both kit form and fully wired; it will allow you to digitally read the receive/transmit frequencies to the nearest 100 Hz. The frequency range (rf input) is from 100 kHz to 50 MHz and the unit has a display format of four 7-segment LED readouts 0.3" high, with the 100-kHz, 10-kHz, and 1-kHz digits in red and the 100-Hz digit in either green or yellow.

The enclosure is what looks to be a Ten-Tec type. It comes with interfacing instructions for more than *twenty* different types of equipment. Chances are that whatever rig you own, it's listed. One really nice feature is a very complete assembly/operating manual (a pleasure to read after seeing some of the faded, poorly written ones that seem to abound these days).

I decided to give my FRG-7 its "new look" one Saturday afternoon while Bob WA2KHR, who shares my fascination with gadgets, was visiting. Bob is helpful to have around, especially if you can get him into a "Hey, that's kinda interesting. . . lemmie see it for a sec" sort of sounding board mode, and then hand him the soldering iron. Anyway, while I was watching a really crummy movie on cable, preparing Dim-Sum, and generally shooting the breeze, the whole digitizing of my FRG-7 took place.

I found only two discrepancies in the interfacing instructions, and these were not difficult to detect and fix: the assembly manual was perfect and explained away most everything. The two errors were:

1. There is no jumper between M and N (step G). You should set the up/down switch in back to down.

2. Step H specifies a DIP switch setting of 545.0, but the 0 DIP setting must be 455.0 (1000 − 545) as per the instructions in the assembly manual (page 17).

All in all, I found that this was a fine piece of merchandise with a very attractive price tag. It works as advertised and I'm glad I finally gave in to the urge to "digitize."

For more information about this product, circle number 202 on your Reader Service card.■

Sailing With Ham Radio

Paradise Cay Publications
1001 Bridgeway, #405
Sausalito CA 94965
Price: $9.95 ppd.

by Chris Schmidt KA1MPL

The yachtsman is faced with many choices when determining what kind of communications equipment to install in his sailboat. *Sailing With Ham Radio*, by Ian Keith WA6DNV and Derek Van Loan WB6VXS, presents an overview of the nautical ham radio option and, in the process, provides an excellent basic description of what ham radio is.

"The word 'marine' on any piece of equipment means that its cost is double that of the non-'marine' equivalent."

SWHR starts by explaining the advantages and disadvantages of ham radio as compared to marine SSB. The main advantage of ham radio is cost (the word "marine" on any piece of equipment means that its cost is double that of the non-"marine" equivalent). Phone patches are cheaper, equipment is cheaper, and you gain a better understanding of your boat's electrical system. On the other hand, marine SSB has no license examination, no restrictions on third-party traffic, and allows commercial communication.

Obviously, the premise of the book is that ham radio is a good option for nautical communcation, and the second section tells you how to go about getting a license—where to get study materials, code tapes, etc. The authors recommend that you go for a General-class license.

Following the licensing information are *very* basic descriptions of electricity and magnetism, as well as how radio works in general. The information here is not at all complete—but it is not an attempt to teach theory for the license test; rather it is to help the reader understand the rest of the book. The illustrations are simple and clear—no intimidating large schematics.

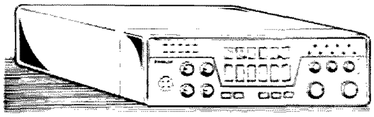
The nuts and bolts of a nautical ham radio station are covered thoroughly. Information about antenna designs, finding a good ground, corrosion, installation, weather FAX, and lightning protection covers the questions that the average sailor would pose. The authors take great pains to explain all ham terms because the terminology is one aspect of ham radio that does scare people away.

Dad Knows Best

My father is a sailor who knows nothing about ham radio. I gave him this book to read

and he loved it. He said that it answers questions he's been wondering about for years. For a sailor interested in learning about ham radio, *Sailing With Ham Radio* is the perfect introduction.

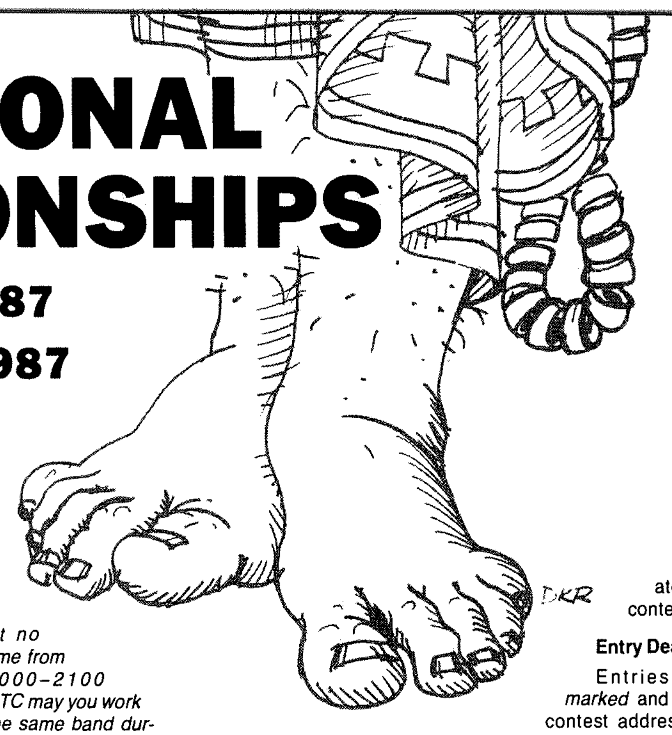
For more information, circle Reader Service number 206.■



THE NATIONAL CHAMPIONSHIPS

CW: September 5, 1987

SSB: September 6, 1987



For the first time ever, the "Little Gun" has a chance to become a National Champion! The National Championships have been designed to recognize the Contest Operator of the Year. Unlike other events, they single out the best Contest Operator in the USA, not just the station with the biggest hardware investment!

There will be a *National Sideband Champion* and a *National CW Champion*. The combination of these two contest scores will determine the *Contest Operator of the Year*.

Contestants, analyze your band plan. *Do not* take these events for granted. They are, without doubt, the most complex stress-testing events on the bands today. If you understand the rules, you'll recognize "traps" strewn in your path. Being lax could spell your doom. Should you work all bands? How do you maintain your QSO rate without sacrificing your multiplier average? Should you be using the monobander? What happens when you switch to 10 or 160 meters for the 10-point QSOs? It's up to you, the *Operator*, to do what's best for you!

EXTERNAL AMPLIFIERS ARE PROHIBITED. Run barefoot (up to 200 Watts maximum exciter output power) or your entry is disqualified.

Contest Dates

The First Annual National CW Championship Contest is at 0000–2400 UTC on September 5, 1987.

The First Annual National SSB Championship Contest is at 0000–2400 UTC on September 6, 1987.

Eligibility

Open to *single-operator stations* within the *50 U.S. States only*. A station must be capable of operating two or more bands; there are no single-band categories. Eligible bands include 10, 15, 20, 40, 75/80, and 160 meters.

Miscellaneous Rules

Stations may operate only *18 hours* of each 24-hour contest. The same station may be worked *once on each band*. For stations submitting a contest entry, *external amplifiers are strictly prohibited*. Exciter output must not exceed 200 Watts.

Mandatory Band Switching

This rule separates the men from the boys. Read it over several times, as it is the toughest rule to interpret. Be sure you understand it! Violators must be disqualified and their entries processed as check logs.

Stations submitting an entry must operate only on a single band during the following time frames: 0000–0300 UTC, 0300–0600 UTC, 0600–0900 UTC, 0900–1200 UTC, 1200–1500 UTC, 1500–1800 UTC, and 1800–2100 UTC. In other words, you must establish a band within a time frame and *cannot* move from that band until the next frame. *At no time from 0000–2100 UTC may you work the same band during two consecutive time frames.* At least one time frame must pass before the same band can be worked again. *From 2100–2400 UTC only* may stations switch to any band as often as they like.

Exchange

All stations must transmit RS(T) and U.S. State.

QSO Points

10 QSO points per valid QSO on 10 or 160 meters. 5 QSO points per valid QSO on 15, 20, 40, or 75/80 meters.

Multiplier Points

1 multiplier point for each state worked on 15, 20, 40, or 75/80 meters. 2 multiplier points for each state worked on 10 or 160 meters.

Multiplier Average

Multiplier average is determined by totalling all multiplier points and dividing them by the number of bands operated.

Antenna Multiplier

3 Antenna Multipliers for each band worked with a wire antenna design or vertical antenna. Antennas must be fed with a single feedline and not be in a phased configuration. Quads are not considered wire antennas!

2 Antenna Multipliers for each band worked with a duo-, tri-, or quad-band antenna fed with a single feedline and not in a phased configuration.

1 Antenna Multiplier for each band worked with an antenna not specified in the previous two categories.

Note that more than one antenna may be used on a band but *only one antenna may be used at a time*.

Final Score

QSO Points x Multiplier Average x Antenna Multiplier = Final Score.

Contest Entry

Entries must include a separate log for each band worked, a summary sheet itemizing QSOs per band, QSO points per band, multipliers per band, antenna multipliers per band, and total accumulated score. Entries must describe antenna used on each band and sign a declaration that the contest operator abided by the contest rules.

Entry Deadline

Entries must be *postmarked* and forwarded to the contest address below no later than October 20, 1987.

Rules, Forms, Entries

Forms are available from the contest committee. Send an SASE to: The National Championships, 2665 Busby Road, Oak Harbor WA 98277.

Disqualifications

Contestants not following the band-switching requirements will be disqualified. Stations falsely reporting antennas used or falsely reporting output power will be disqualified. Scores requiring more than a 3% scoring adjustment due to duplicate contacts or scoring errors will be disqualified. Contest committee decisions are final!

Penalties

A penalty of one multiplier point, before averaging, will be assessed for each duplicate contact count on the same band and not discounted by the contestant on his/her entry.

Awards

A minimum of 250 QSOs must be worked to be eligible for awards. Awards will be issued to the operator with the most points in each *Call District* and *U.S. State*. Plaques will be issued to the National SSB Champion and National CW Champion.

The CONTEST OPERATOR OF THE YEAR TROPHY will be awarded to the contester with the highest combined score for the two contests. ■

Send For Your National Championship Entry Forms Today

The National Championships
2665 Busby Road
Oak Harbor, WA 98277

Robert E. Bloom W6YUY
8622 Rubio Avenue
Sepulveda CA 91343

The Two-Meter Transverter Project

Build this VMOS transverter and use all of your Kenwood TS-940's bells and whistles—on two meters!

You are the proud owner of Kenwood's amazing TS-940S. After about two months of discovering new buttons every day, you've run across the transverter access jack on the rear panel. Now that you have found it, what do you do with it?

Interfacing a transverter with the 940 not only allows you to expand the 940's frequency range into the VHF or UHF range but also enables you to use all of the 940's modes and functions up there. In addition, you can enjoy direct frequency readout to the nearest 10 Hz.

I operate OSCAR 10 and SSB on 2 meters. Initially, I decided to make up a TS-940 converter interface for use on OSCAR. The unit features a highly stable grounded-gate rf amplifier, a 40-MHz third-overtone crystal oscillator, and a tripler for a 120-MHz output. This would call for a 24-to-28-MHz vfo i-f from the TS-940 for direct frequency readout—24.0 MHz representing 144 MHz, 25.0 representing 145, and 28.0 representing 148, along with fractional readout in between. The OSCAR 10 beacon, for example, reads out 25.810.00 (145.810 MHz).

The excellent operation of the converter/940 comboprompted the development of a full 2-meter transverter, which expands the 940 communication range to include 2-meter SSB, AM, and FM. You will soon find that you can work long-haul DX on 2-meter SSB without repeaters. SSB gets out great where FM does not. If you must use FM, the 940's frequency split and smctf setsmc buttons put you on any pair you want in a flash.

The project breaks down into three segments, but does not include the required 13.0-volt regulated power supply. The first segment is the receiver converter (Figs. 1 and 2); the second is the linear low-level transmitter amplifier stages (Figs. 3 and 4); and the final module is a two-stage, state-of-the-art, and fascinating VMOS 40- or 60-Watt linear amplifier (Figs. 5 and 6).

Basic Material for Boards and Cases

Although both single- and double-sided printed circuit material is used, you will be relieved to know that you will not be required to make etched boards. The basic circuit boards will have circuitry on both sides that are interfaced through #55 holes drilled through the board. The PC material is used for four purposes: double-sided board for the basic circuit, shields, and module case and single-sided material for terminal pads to hook all the components to.

If you have a facility for cutting PC boards, you have an advantage. If not, you can do as I did—scribe, break, and file. It is not as difficult as you might imagine. Take an old 1/2"-wide chisel, grind the sides more or less thin and parallel, and form a sharp hook on the front side. The hook is fashioned to scribe deeply through the foil and into the fiber or glass material.

You will need a cutting board about 1/2" to 3/4" thick, two 3" or 4" C clamps, and a stout piece of steel to use as a straightedge. Mark off the material and clamp the straightedge to the material to be cut, the waste side exposed to the cutting edge of the chisel. Draw the

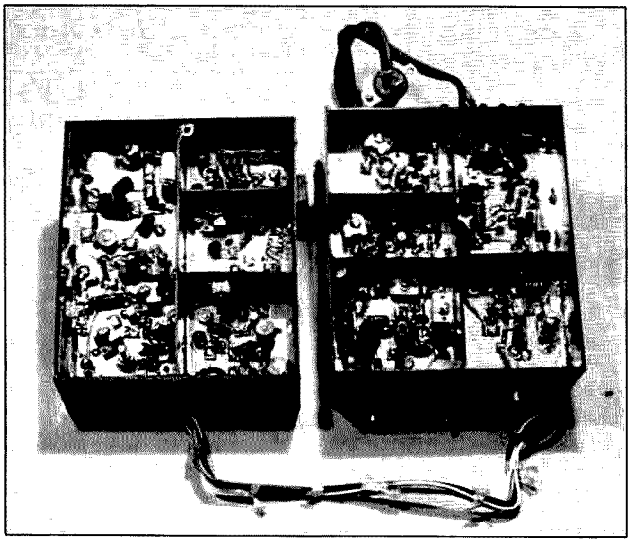


Photo A. Top view of the receiver and transmitter modules.

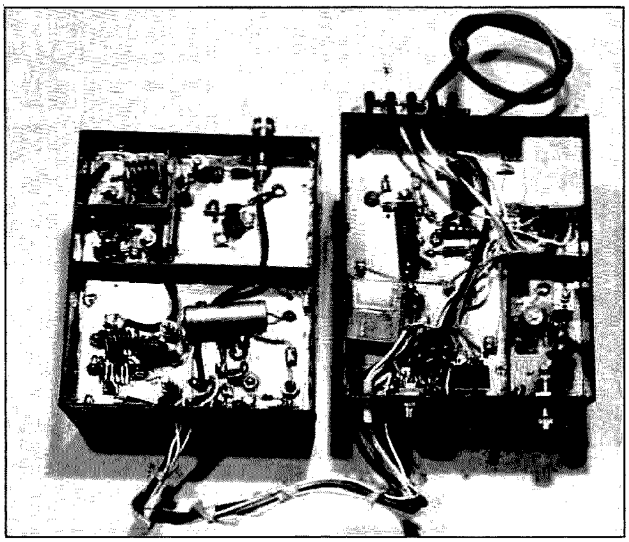


Photo B. Bottom view of the receiver and transmitter modules.

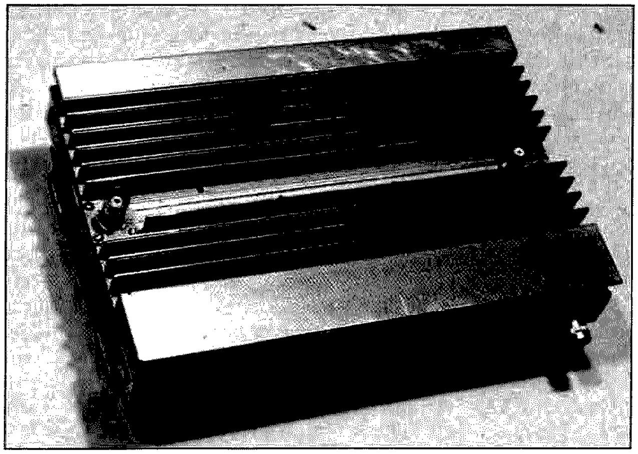


Photo C. Top view of the power amplifier showing the heat sink.

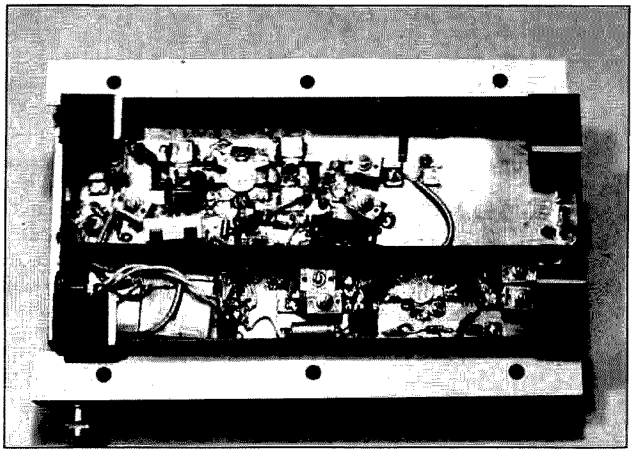


Photo D. Bottom view of the power amplifier.

chisel along the scribe line, scoring away the material. It will take six to eight swipes to get the edge deep enough. For the initial large cuts, it will require scribing the board on both sides.

The material can be snapped off while still clamped, or it can be placed between the jaws of a bench vise. As the pieces become smaller, the breaking of the material is all done in the vise. Like-sized pieces, such as the box sides, are stacked together and filed square in the vise. The material should be checked with a 6" or 12" carpenter's square. This operation is time-consuming but surprisingly easy and precise.

The single-sided material is cut into strips 1/8", 3/16", 1/4", and a couple 5/16" wide. The wide strips are used on the power amplifier. These strips are cut to the desired length with side-cutting pliers (commonly called dikes). These pieces are the soldering terminal pads and are securely set into position on the circuit board with one or two drops of Eastman 910 adhesive (or Krazy Glue®). It takes about four seconds to set up and can be soldered to immediately.

Box Measurements

The receiver converter fits into a module 5" x 4-1/4" x 2" divided into an upper section 1-3/16" deep and a bottom section 3/4" deep (Fig. 2). This allows for the 1/16" section separator board thickness. Cut the

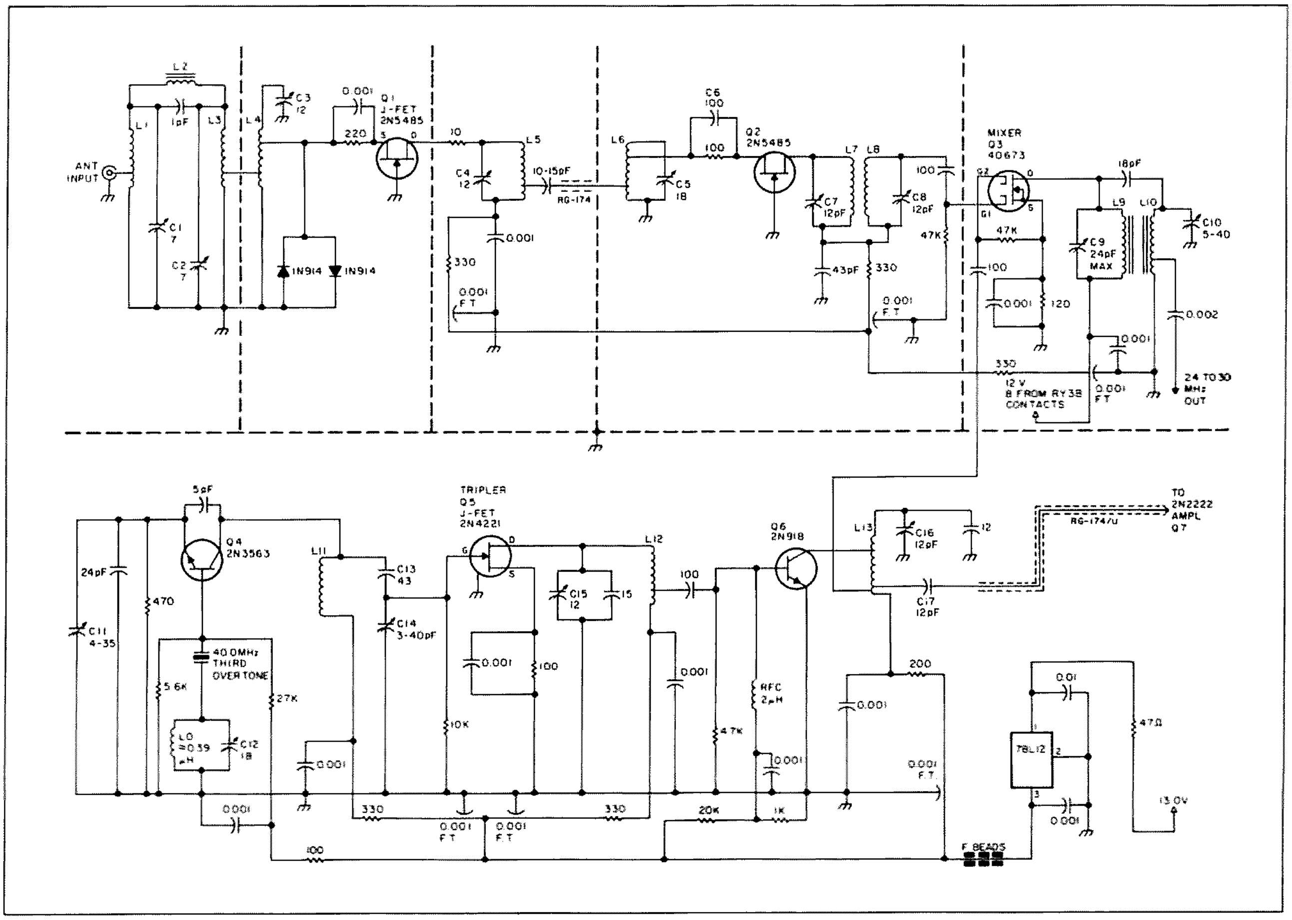


Fig. 1. Two-meter receiver converter.

long side sections to 5-1/8" and the narrower ends to 4-1/4". I used the weight and squareness of a drill press vise to prop the material in position while spot-soldering the boxes together. You will need small pieces of jig material to hold the main board to the proper height position for the initial soldering of the box.

The low-level transmitter module is 5" x 4-3/8" x 2" (Fig. 4). Here again, make the longer side material 1/8" longer than the 5" main board length to compensate for the 1/16" thickness of the two end pieces.

The dimensions of the power amplifier will somewhat depend on the heat-sink material you use. My heat sink was 8" x 5-1/2". The nine cooling fins were only 1/2" deep, but were ridged on both sides. I recommend 3/4" to 1" fins. The PC board mounted within the heat sink and measured 7-3/4" x 3-3/4" (Fig. 6).

The driver and final stages were laid out parallel to one another rather than in the more conventional serial layout. A shield of double-sided material separates the stages. A length of 1/8" 50-Ohm RG-174 coax connects the output of the driver to the input of the final. I suggest a board width of at least 4" rather than the 3-3/4" I used. The final stage could be brought forward by about 1" to avoid crowding at its output.

You can lay out the parts sequentially as construction progresses stage by stage from the schematic. The component layouts mainly show transistors, coils, tuning capacitors, some coupling capacitors, and feedthrough capacitors in their relative placements. From there, it is easy to determine the position of the other components, namely 1/4-Watt carbon resistors and .001 disc ceramic bypass capacitors. Other capacitors are dipped silver micas (dog-bone type). There is no reason to crowd, as there is plenty of room in each compartment for all of the components, even if those you choose are somewhat larger.

Interfacing the System With the TS-940

Since Kenwood does not make a transverter, they provide practically no information about using one, although they do give a very abbreviated drawing of the jack and its pin identifications. For more than this, you must refer to the Kenwood parts layout and schematic diagrams, which is quite a chore. The information in Fig. 7, a wiring diagram that includes the relay circuits, is what you need.

Inserting the special 8-pin DIN plug into the jack immediately inhibits the 940's LF transmit capability. The plug mechanically activates switch contacts that isolate circuitry from the HF antenna connections. (Refer to the service manual schematic on the upper left corner of page 103.)

Here are the pin functions from page 29 of the operator's manual: Pins 1 and 3 are grounding connections for the shields of RG-174 coax. Pin 2 provides the 12 volts @ 50 mA needed to activate an external control relay. Pin 4, when grounded by an external switch, activates an internal (940) relay (#3), which disconnects the 940's vco from its rf amplifier input stage. Pin 5 accepts the transverter's receiver mixer output (24-to-28-MHz) signal. Pin 6 is an ALC signal if you need it for an amplifier. Pin 7 provides a vco i-f signal output of about 100 mW for the transverter's transmit mixer. Pin 8 is the 940's internal high-frequency antenna junction.

Get an 8-pin mike plug and jack—the same as on your mike input to the 940. This will become the input plug for the transverter. It and a triple-pole double-throw switch are installed on the low-level transmitter module where all control takes place.

Make up a 5-wire cable approximately 18" long; attach the DIN plug at one end of the 8-pin mike plug on the other. Three of the conductors will be RG-174 1/8" 50-Ohm coaxial cable (available from Henry Radio). The coax cables connect to pins 5, 7, and 8. Insulated stranded 20-gauge wire conductors connect to pins 2 and 4. To avoid confusion, the same numbering is used on the mike plug end as is used on the DIN plug. The on/off switch provides a ground return for the 940's transverter jack pin 4 as noted above. It also provides 12 volts to the transverter oscillator chain and it connects pins 5 and 8 of the DIN plug together to reestablish low-frequency transmission capability to the 940 when the transverter is turned off.

Now, before I get into the construction part of the transverter, there is a necessary bit of vital information about the 940 of which you should be aware. Ham equipment with full coverage of 2 to 30 MHz has built-in transmit-inhibiting circuitry so that the equipment will not transmit out of the authorized ham bands. You will, however, need transmitting capability from 24 to 28 MHz in order to use the transverter.

In order to have this capability, you will have to cut diode D130, which is located on the unit B PC board located just behind the LCD sub-display and the notch squelch control. (This information was previously published in the Kenwood newsletter of the International Radio

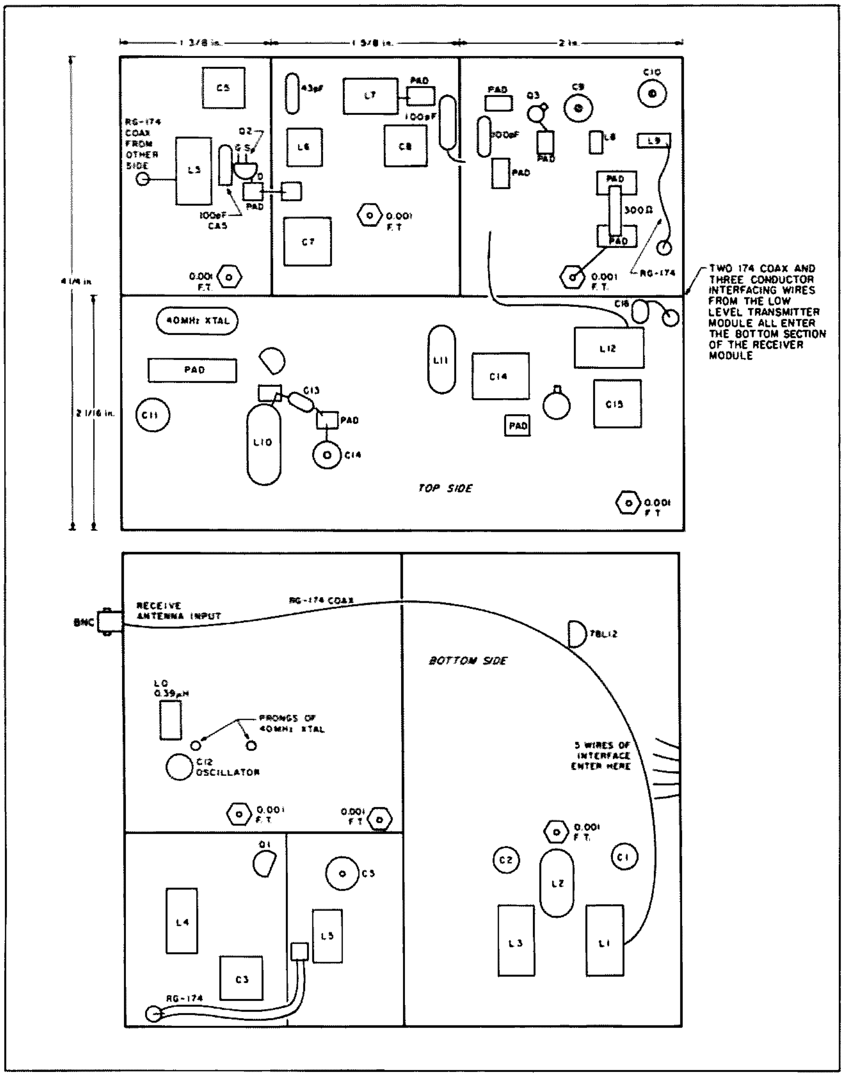


Fig. 2. Relative parts placement diagram for the receiver converter.

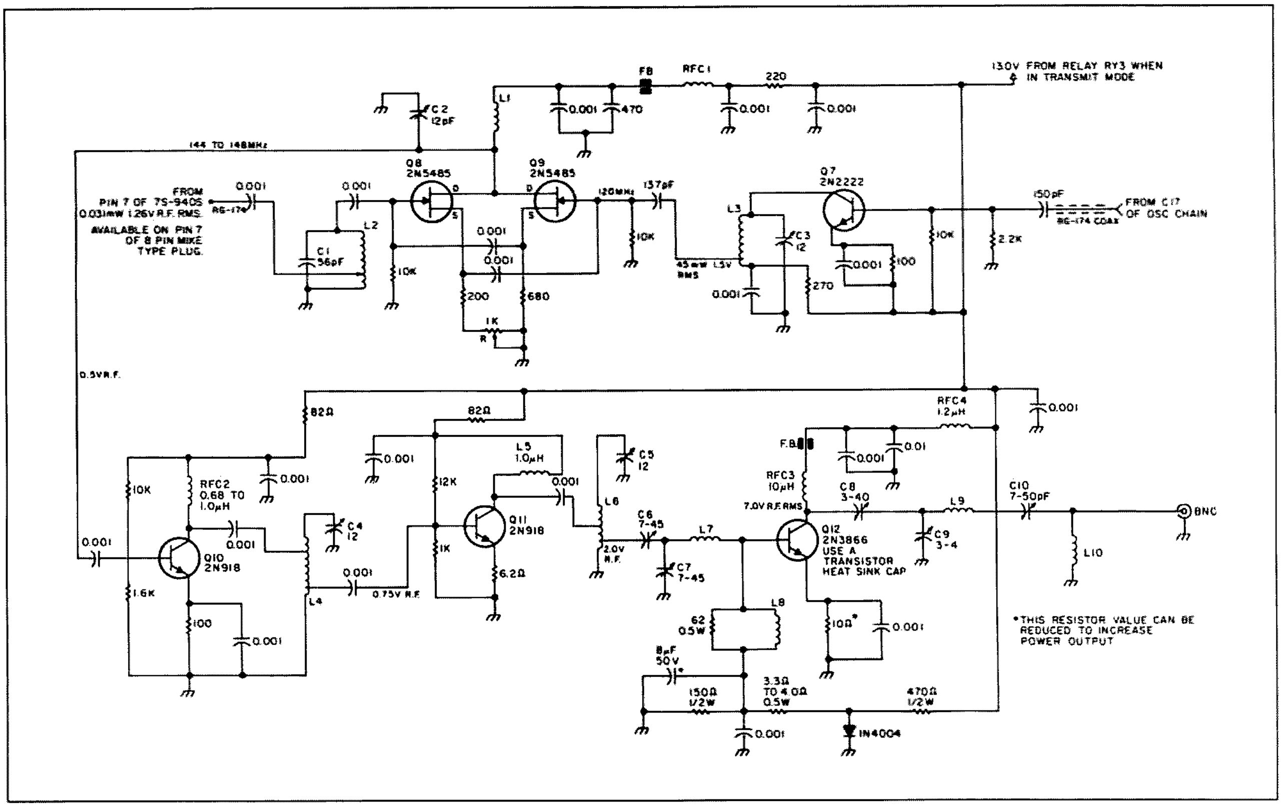


Fig. 3. Low-level transmitter mixer and 144–148-MHz linear amplifier chain.

Club, issue 54, May, 1985.) Now, let's proceed in earnest to the heart of the technical material.

Receiver Converter Description

The basic circuit concept with much modification and redesign was made around the converter published in the 1985 ARRL *Handbook* (from the chapter on VHF equipment, page 31.5). I had difficulty getting any of a quantity of overtone crystals to operate as described in the oscillator circuit shown. All of the crystals wanted to oscillate on their fundamental, but did put out the third overtone at the drain. Despite that, all of the crystals were military overtone devices. I was unable to isolate the fundamental of 13.33333 MHz while trying to get a single JFET to multiply out to 120 MHz in its output drain. It might work with some crystals, however.

This circuit was redesigned using a bipolar 2N3563; it will work equally well with a 2N918 or 2N2222. One of my converters worked well with an air coil in L11, but I detected some stray signals radiating in a second unit. The condition was resolved by use of a capacitive divider and a toroidal inductor. Attempting to obtain too much from a single stage has its drawbacks, so I added a tripler circuit.

There is always a loss in output when you are frequency multiplying. For a rule of thumb, you can retain about 55% of the input power in doubling and about 35% when tripling. I thought of using a 60-MHz crystal and a doubler, which may have eliminated one of the stages in the chain, but I had second thoughts on the matter.

Before leaving the oscillator stage, I should note that the lowest frequency obtainable from the oscillator with the crystals purchased was 375 Hz high. Adjustment of C1 only increased the frequency further. A small inductance that I designate as L0 was added to the end of the crystal that would normally go to ground. This brought the frequency down by about 500 Hz.

Too much inductance will stop oscillation altogether. I ended up with about .39 uH, .5 uH, or .6 uH maximum. You can make up this inductance by winding #36 wire on a 1/4-Watt resistor of 5,000 Ohms or higher. Start with about 20 turns and remove turns until the frequency is down by about 400 Hz. A small trimmer or air capacitor can tune the inductance. I used a 3-to-22-pF air trimmer, but it only required about 10 pF. I tuned out one-half of the capacity in C11, then set the exact frequency or slightly below with C12, then tuned it right on with C11.

The test point for the counter probe was at the capacitor divider junction (C13 and C14). I used the counter test probe in its X10 position for minimum circuit loading. Another way would be to hold the tip of the probe near L13 and adjust the oscillator to exactly 120 MHz. If the crystal you use falls below 40 MHz with one side of the crystal to ground, you can eliminate L0 and C12 by directly grounding that side of the crystal.

The tripler output is tuned to 120 MHz by virtue of L12 and C15. I used a 2N4221 JFET for the tripler, although a 2N5485 or 5486 and others can be substituted. An additional 120-MHz stage was needed, but did not require a great deal more gain for receiver injection.

Some additional oscillator level is required for the transmitter section. This initially created a moderate problem: The first unit I made up had just enough gain in this stage to provide the proper receiver mixer injection voltage one turn off the hot end of the coil. Everything was fine until I got to the low-impedance point for driving the additional stage for the transmitter where the tap was just off the cold end.

When I switched to transmit, the lower impedance tap on L13 was less of a load on the circuit and required less capacity for resonance. I had to provide a diode-switched capacitor in the circuit to regain resonance for receive. The present revised Q6 circuit now supplies enough gain so that the receiver injection point is just above that for the transmitter and no additional compensating capacitor is required.

Cascaded Front End and Filters

A previous converter had intermod from a local FM station. I had to build a separate outboard filter to take care of this problem. On the input of the revised circuit located on the bottom side of the receiver module is a combination bandpass filter and an 88-MHz commercial FM band filter. This converter also has cascaded JFET pre-selector stages. Each stage has approxi-

mately 12 dB of gain. A single dual-gate MOSFET stage would provide 25 dB of gain, but could be quite unstable, especially in combination with my mast-mounted (low noise figure, 20-dB gain) GaAsFET preamplifier. Grounded-gate FETs have only about one-half the gain of a dual-gate MOSFET, but they have two big advantages: low noise and high stability.

The first stage, including the separately shielded L5, is also located on the bottom of the receiver module. A low-impedance tap on the coil connects to a 10- or 15-pF capacitor, then through a short piece of RG-174 50-Ohm coaxial cable up to the top side of the board and to the second grounded-gate stage where L5 and Q2 have separate shielded compartments.

The mixer stage Q3 is a dual-gate MOSFET. The broadband mixer output is made up of 1/4" toroidal core inductors. Although I had fixed capacitors across these coils, the exact capacity would depend on the variations in core material, so I suggest small variable capacitors across both L8 and L9.

Summing up, the components in the converter, the oscillator tank, and the tripler stage use toroid core coils as does the 24-to-28-MHz mixer stage. (Toroidal cores are available at a nominal fee from Amidon Associates, 12033 Otsego Street, North Hollywood CA 91607.) The Q6 120-MHz oscillator stage of the receiver does not have sufficient power for the transmitter mixer, so an additional stage Q7 was added. A 2N918 or 2N2222 can be used. There is at least 1.5 V rms at its output for a minimum of 45 mW.

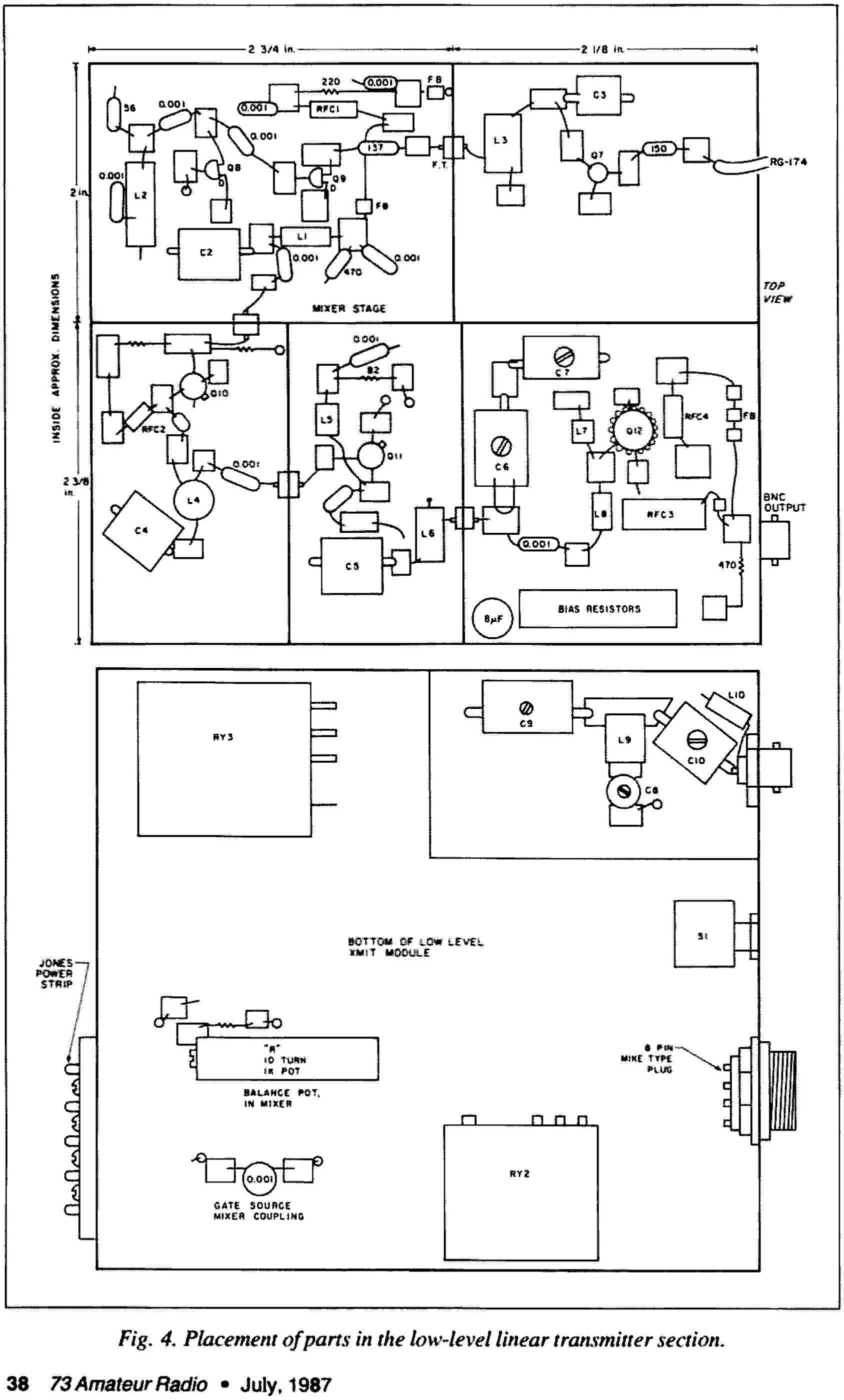


Fig. 4. Placement of parts in the low-level linear transmitter section.

Transmitter Mixer Circuit

I researched a myriad of possible mixer circuits, including both active and passive double-balanced designs. Each was rejected for one reason or another. Serious consideration was given to the passive double-balanced design. But major advantages were immediately apparent by substituting bipolar transistors for the diodes. This brought things into the active concept: bipolar versus MOSFETs. A comparison of major characteristics, such as dynamic range, suppression of intermodulation products, and cross-modulation effects, was performed.

FETs have inherent transfer characteristics approaching a square law response; thus, third-order intermodulation products are much reduced over that of the bipolar device. Harmonic distortion and cross-modulation effects are third-order dependent and are greatly reduced when FETs are used in an active balanced mixer. A secondary advantage is derived from the available conversion gain so that the FET mixer becomes simultaneously equivalent to both a demodulator and a preamplifier. Finally, the FET has an advantage in both signal conversion and local-oscillator noise reduction. In the final resolution, a single active balanced mixer using a pair of 2N5485 JFETs into a 50-Ohm configuration was selected.

The 24-to-28-MHz output from the TS-940 has a peak-to-peak output of about 100 mW. The 1.26 volts measured is about 31 mW rms. Its input to the mixer is at the 50-Ohm tap on the input toroid (L2). The 45 mW from the L13 tap from the Q7 stage provides a 120-MHz mixer output of approximately 0.5 volts rms.

The mixer potentiometer (R) should be adjusted for minimum 120-MHz signal in the mixer output. This should be observed on a scope or spectrum analyzer. If none is available, adjust the source resistance in Q8 to equal that in Q9.

The mixer output is amplified through three 120-MHz linear-amplifier stages. The Q10 stage at its low impedance output is 0.75 V rms. The output at a similar point at Q11 measures 2.0 volts rms. Each of these two stages uses 2N918 bipolar transistors. The third hard linear biased stage uses a 2N3866. The linear output measures between 400 and 500 milliwatts. When the 10-Ohm emitter resistor is paralleled with another of equal value, the output increases by another 100 mW. With the emitter connected directly to ground, the output is between 850 and 950 mW depending on the supply voltage of 12.5 and 13.5 volts. A small heat-sink hat should be placed on the 2N3866. The transistor normally runs cool to the touch but will heat up when swr is present.

Up to this point, the transverter was pow-

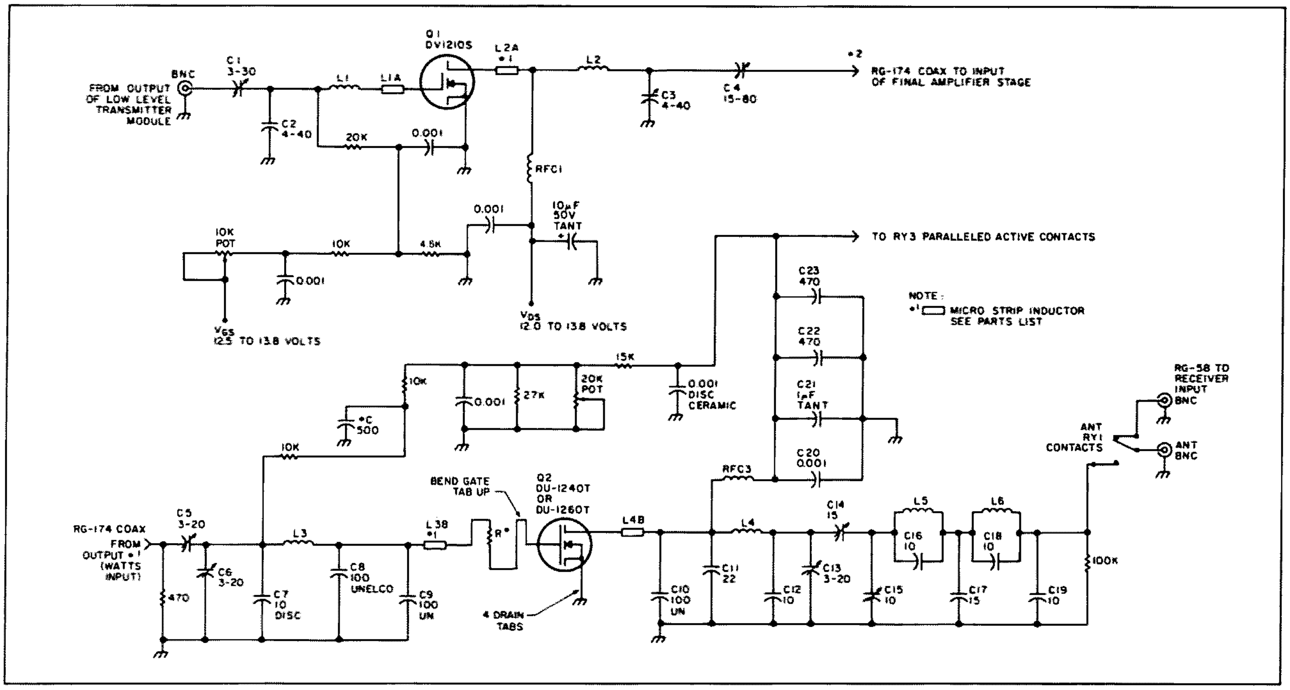


Fig. 5. VMOS-power power amplifier.

ered with a 1.2-Ampere hour 12-volt gell cell, and a range of 40 miles was conducted on SSB AM and FM during a test program.

VMOS Power FET 60-Watt Amplifier

The DU-1240T and 1260T are N-channel MOS power FETs operating in an enhancement mode, and they have generated one of the most interesting aspects of this program: VMOS—vertical metal oxide semiconductor field effect transistor. Up until a short time ago, VMOS was entirely new to me. These devices are not similar to bipolar transistors; they are more like vacuum tubes, but different from both. As examples: Bipolar transistors have low input and output impedances. The input and outputs look inductive; the hotter they get, the more current they draw, and thus they get hotter until they self-destruct.

VMOS or MOS power FETs are high-impedance devices (possibly higher than vacuum tubes), are capacitive devices rather than inductive, and the hotter they get, the less current they draw until they shut themselves off. Bipolar transistors are made for specific operating frequencies. As these devices have much more gain at lower frequencies, they are prone to self-oscillate at the lower frequencies; therefore, the voltage supply circuits must contain filters and bypassing for both high and low frequencies or else they will burn up.

VMOS, on the other hand, has a very flat frequency gain response and can be used at any frequency below the highest design frequency. Ideally, a 500-MHz unit can also be used at any low frequency. It is common to see a 400- or 175-MHz VMOS transistor used in a broadband 2-to-30-MHz amplifier. They can be biased for class A, B, C, D, and E operation. Oth-

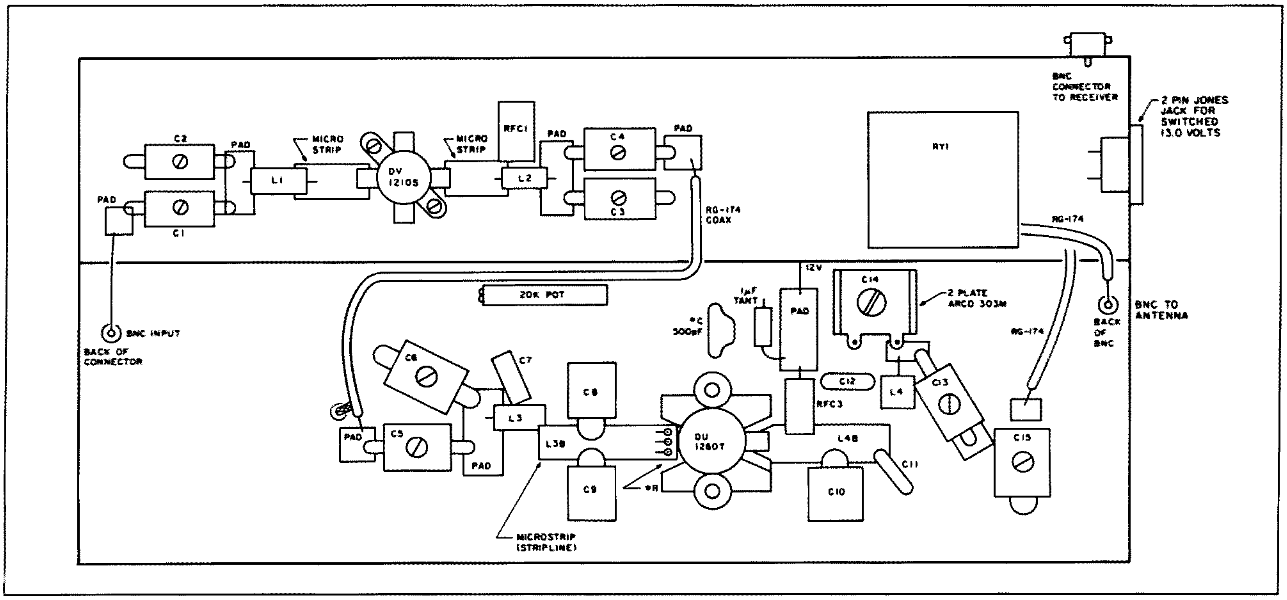


Fig. 6. Approximate orientation of major components for the power amplifier.

er than for low signal levels, bipolar devices cannot be used in class A operation and for the most part are made to operate in class C. Most manufacturers state that you cannot destroy a VMOS device by overdriving, and some will not admit to sudden failure in a new design because of oscillation.

In order to make a VMOS operate in class A or B, it is necessary to set up a quiescent drain current level by biasing the high-impedance input gate with a positive dc voltage level. The gate circuit has a thin barrier wall to the source. Self-oscillation can break down this wall in a few milliseconds, destroying the little devils. In a new circuit, they may have to be tamed.

Another feature that differs from the vacuum tube or bipolar transistor is that a common spec for mismatch tolerance is 30:1 vswr. The standard practice of M/A-Com Phi, Inc., one manufacturer of VMOS, is to test all of their production devices at an swr of 20:1. Junction temperature of the devices is 200° C (392° F). Nominal power gain is 10 dB; efficiency is 60% or better.

The three devices selected for use in this amplifier were the M/A-Com DV-1210S, DU-1240T, and DU-1260T, all 12-volt devices with linear output levels of 10, 40, and 60 Watts, respectively. Operating voltage is 12.5 volts. Maximum voltage for the drain is 45 V, source 30 V; total maximum device dissipation is 160 W and 240 W, respectively, for the 40- and 60-Watt units. On the 60-Watt unit V_{GS}, the gate to source bias voltage of 4 volts will produce a 6.0 Ampere quiescent drain current. (See Fig. 8.)

DV-1210S		DU-1240T		DU-1260T	
V_{GS}	I_D (Amperes)	V_{GS}	I_D (A)	V_{GS}	I_D (A)
1.5 V	0.0	2.0 V	0.0	1.5 V	0.0
2.0	0.020	2.1	0.100	2.0	0.500
3.0	0.200	3.0	0.600	3.0	2.0
4.0	0.550	4.0	1.5	4.0	4.0
5.0	1.0	5.0	3.0	5.0	6.0
6.0	1.5	6.0	4.0	6.0	9.0
7.0	2.0	7.0	6.0	8.0	10.5
8.0	2.5	8.0	7.5	10.0	11.0
9.0	3.0	10.0	10.0	12.0	12.0
10.0	3.5				
12.0	4.5				

Table 1. Typical transfer characteristics: I_D drain current versus V_{GS} gate voltage (drain voltage of 12.5 volts.

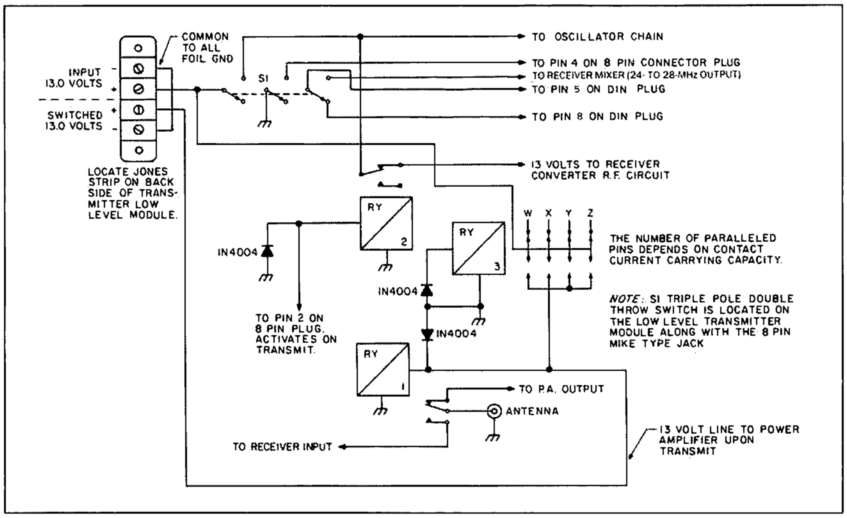


Fig. 7. Wiring and relay-switching diagram. Pins to the transverter plug on the TS-940S: 1 and 3—ground for coax shields; 2—12 volts @ 50 mA on xmit; 4—transverter on/off switch; 5—Rx signal from converter; 6—ALC external; 7—rf output to Tx mixer, 24 to 28 MHz (vfo); 8—940S HF receiver signal connects to pin 5 for normal xmit operation of 940 on HF (connects to RY3).

Physical Placement of Components

It is important to connect both top and bottom foil surfaces of the PC board together at a number of points around the perimeter and at two points near the source of both power transistors. Drill #55 or smaller holes and feed a small gauge tinned wire through each hole; solder on both sides of the board.

It will be necessary to cut rectangular holes in the board for the heat sink of both transistors. Allow just enough clearance for the transistor mounting to pass through the hole. There should not be more than 1/16″ overall clearance—that's 1/32″ all around.

Mount the transistors with H-40 thread machine screws. This means careful drilling and tapping. Take it easy and use a lubricant when tapping. The DV-1210S transistor package has four terminals with a cross configuration in respect to the heat-sink mounting; therefore, the rectangular hole will be 45 degrees to the line of input/output.

The DU-1240T and 1260T transistors have six tabs. The outer four tabs are the source,

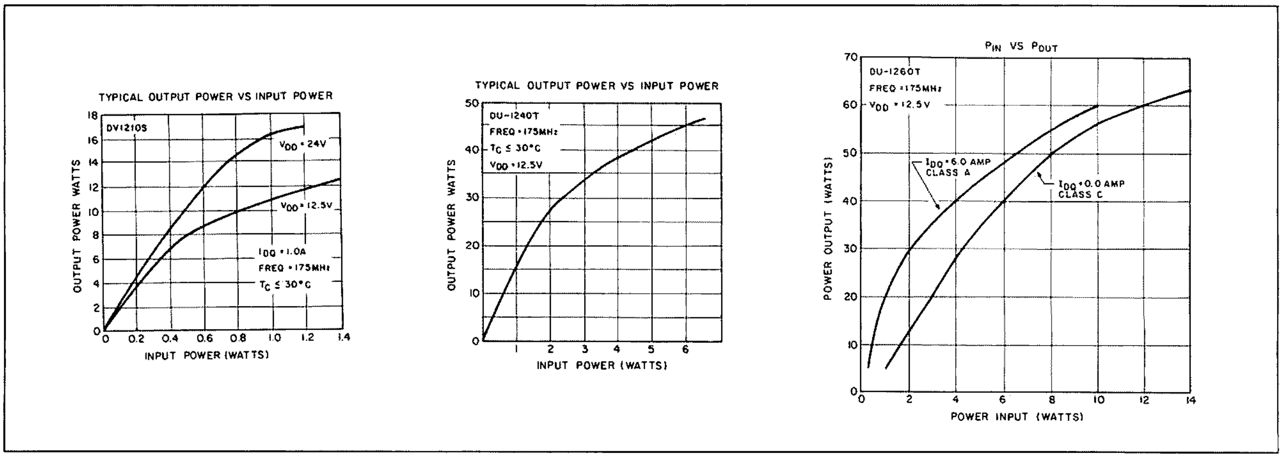


Fig. 8. Power input versus power output for the DV-1201S, DU-1240T, and DU-1260T, plotted with data from Table 1.

and eventually get soldered to the top foil. The cutout for these transistors is at right angles to the direction of component layout.

Referencing the schematic (Fig. 5), you will notice a rectangular box at both the gate and drain of each transistor. This is a small stripline inductance etched into the foil. You might wonder why this is not made up like a large solder pad. The additional 1/16" board thickness would put a strain on the transistor tabs. The PC board is already raised above the heat sink by about 3/32", or almost the thickness of two boards less foil. You do not want the PC board material to pick up the radiated heat from the heat-sink material. If you want to experiment, you will have to reduce the board clearance by about 1/16". The rectangular inductances are called out as L1A and L2A on the driver stage and are about 1/2" long. L3B and L4B on the more critical final are 1" long.

On the final stage, it will be necessary to taper the ends of the inductors closest to the gate and drain so that the grounded source tabs do not touch them and short the gate or drain. It is also prudent to make a diagonal cut away of the source tab material on the inner edge of all four tabs.

Note the resistor *R at the gate of DU-1260. This was necessary to set up a negative feedback voltage to prevent oscillation. Take three 10-Ohm carbon 1/4-Watt resistors and prepare them as follows:

Cut one end to a length of approximately 5/32" and bend it at a right angle to the resistor body. Bend the other end back along the body of the resistor, approximately 3/8". Bend the gate transistor tab upward 90°. The 3/8" lead of each of these resistors is sweat-soldered to the rectangular inductance, and the resistors stand vertically up from the board. These may not be necessary if the stage is stable. I used them with the 40-Watt device, but the 60-Watt device required more drive, which was reduced with the resistors in the circuit. I did not use them in the 60-Watt amplifier.

The Unelco or Underwood noninductive 100-pF C8 and C9 capacitor tabs are soldered to the center of the rectangular inductance, one capacitor on either side (across from one another with tabs almost touching). Solder the capacitor cases to the foil ground. C10 (100 pF) connects to the midpoint of L4B. The RFC3 connects midway between the C10 tab and the drain. C11 (22-pF) connects to one corner of L4B. The coil (L4) connects at a point next to the C11 connection. You will need a 1/2" x 1/4" solder tab placed in a direction inboard and at right angles to the input end of L4B.

There are four components with one of their ends connected to the pad: the output end of L4, C12, C13, and C14. If the output harmonic filter is incorporated, C15 will be a 10-pF fixed disc ceramic NPO. If not, this becomes a 3-20 (approximately) variable mica compression trimmer (Arco #422 or equivalent).

I did not incorporate this filter in my design. Instead, I made up a separate module using BNC connectors and a T filter picked

Receiver Converter Major Components Parts List

C1, C2	1-7-pF miniature piston type
C3, C7, C8, C15, C16	2-12-pF 8-plate E. F. Johnson or equivalent
C4	3-18-pF plated air capacitor or equivalent
C5	4-20-pF 14-plate E. F. Johnson air capacitor or equivalent
C9, C10, C14	Miniature flat-wafer-type 7-40-pF variable
C11	4-35-leaf postage-stamp-type variable Arco or *equivalent*
L0	See text for variations on coil L0 in oscillator
L1, L3	7 turns #16 tapped at 1-1/2 turns from ground end
L2	32 turns #24 on T-50-12 toroid core or 27 turns #26 on T-37-10 core (1 pF on L2 can be a low selected value to set the 88-MHz notch.)
L4	5 turns #18, 5/32" tapped at 1-1/4 turns and 1-3/4 turns from ground end
L5	5 turns #18 wound on the threads of a 1/4" 20-bolt tapped at 3/4 turns from ground end
L6	5 turns #18, 5/32" diameter tapped at 1-1/4 and 1-3/4 from low end
L7	5 turns #18, on 1/4" 20 bolt
L8	4 turns #18, on 1/4" 20 bolt set at right angles with L7
L9	15 turns #28, on T-25-6 Amidon toroid core
L10	14 turns #28, on T-25-6 Amidon toroid core tapped at 4 turns
L11	15 turns #18 on T-50-12 core
L12	4 turns #18 on T-50-12 core tapped at 1 turn
L13	4 turns #18 on 1/4" 12 x 20 bolt tapped at 1/4 and 1/2 turn from ground end
Q1, Q2	2N5485 or 2N5486 or equivalent JFETs
Q3	40673 dual-gate MOSFET or equivalent
Q4	2N3563
Q5	2N4221 JFET or equivalent
Q6	2N918 or equivalent

Low-Level Transmitter Major Components Parts List

L1	7 turns 1/8" #18 enameled wire, 1/8" inside diameter close wound
L2	27 turns, #22 enameled wire tapped at 14 turns, wound on T-50-12 core
L3	5 turns #18, 3/8" tapped at 3/4 turn on cold end
L4	5-1/4 turns #18, 3/8" diameter tapped at 1/2 and 1-1/2 turns from hot end
L5	.56-uH RFC
L6	4 turns #18, 9/32" diameter tapped at 1-1/2 and 2-1/2 turns from hot end
L7	3 turns #18, 1/8" diameter
L8	10 turns #28 enameled, on a 62-Ohm 1/2-Watt resistor
L9	5 turns #18, 1/4" diameter
L10	6-hole ferrite #43 material, .394" long and .236 o.d. or #73 material .437" long and .062 o.d. (Amidon Associates or equivalent, 3 turns #28 wire)
RFC1	1 uH
RFC2	.56 uH
C1	56 pF to broadband resonate L2, 24 to 28 MHz
C2–C5	2-12-pF 8-plate E. F. Johnson 189-503-45 or *equivalent*
C6–C10	7-45 or 7-50 leaf-type mica compression trimmers type 403 or 235-7345-P026 Arco #422 or #426 or equivalent
Q7	2N2222
Q8, Q9	2N5485 or 2N5486
Q10, Q11	2N918
Q12	2N3866
	1 miniature TPDT switch
1-8	Pin special DIN plug from Kenwood
1-8	Pin mike jack, male from Henry Radio
1-8	Pin mike plug, female from Henry Radio
RY3	4-pole double-throw 12-volt (small RY with stout contacts)
RY2	SPDT 12-volt (heavy gold-flashed contacts)
RY1	A small relay similar to RY2 to be situated in the power amplifier for antenna switching
1N4004 or 1N4005	3 each, to be used as transient suppressors across the relay coils

Except for critical circuits, most values of capacitors and resistors are ±30%.

Power MOS Amplifier Major Components Parts List

Q1	DV-1210S power MOS transistor, M/A Com Phi, Inc.
Q2	DU-1240T or DU-1260T as above
L1	4 turns #22, close wound, 1/8" inside diameter (enameled)
L2	3 turns #20, close wound, 1/8" inside diameter (enameled)
L3	3 turns #20, 5/32" diameter, enameled, close wound
L4	2 turns #20, 5/32" diameter, enameled, 5/32" diameter
L5, L6	Filter optional, 2-1/2 turns #20, 5/32" inside diameter
L1A, L2A	Are strip line inductances etched or scribed into the PC board material, 1/2" x 1/4"
L3B, L4B	Are strip line 1" x 1/4" in PC board
RFC1	8 turns #20 enameled, 1/4" inside diameter, close wound
RFC2, RFC3	9 turns #20, 5/32" inside diameter, close wound
C1, C2	Small compression mica trimmer capacitors Arco or equivalent
C3	Small compression trimmer as above, 15–80 pF
C4	As above in 4–40 pF
C5, C6	As above in 3–30 approx.
C7, C12	10-pF disc ceramic short leads
C8–C10	100 pF Underwood, Unelco, or other non-inductive leadless capacitor
C10	Can be variable
C11	22-pF short lead disc ceramic
C13	3–20 compression mica capacitor (1" size body), preferably if running 60 Watts
C14	Arco 303N 10–80 pF
C15	3–25-pF 303N 10–80 pF
C16, C18, C19	10-pF NPO disc ceramic
C17	15-pF mica ceramic
C20	.001 disc ceramic
C21	1-uF tantalum
C22, C23	470-pF disc ceramic or short-lead dipped silver mica
*R	See Text. 3 each 10-Ohm 1/4-Watt carbon resistors
*C	500-pF low-inductive capacitor

Use .001 disc ceramics in the 13-volt line whenever entering a new branch.

Underwood/Semco metal-clad noninductive rf mica capacitors and other hard-to-locate items are available from Communications Concepts, Inc., 2648 North Aragon Avenue, Dayton OH 45420.

out of the fourth edition of the *RSGB VHF/UHF Manual*, chapter 7. (*Modified T filter*—Two 1/2"-diameter 4-turn coils spaced 3/8" on a single winding of #14 tinned wire, spacing of one wire diameter between turns. A 2–22-pF Arco capacitor from junction to ground. Case made of double-sided PC board. 2-1/4" x 2" x 1-1/4" outside dimensions. Ends of coils grounded to sides of case just below BNC connectors. End coils tapped at 3/4 turn, each connected to a BNC connector. Tap should be matched for 50 Ohms using Bird 43 power meter and 50-Ohm termination and reflected power mode. Output of coil finally matched to antenna filter is tuned to center of 2-MHz band segment prior to the optimum adjustments.)

A 1" high double-sided shield is placed lengthwise between the driver stage and the final. A short length of RG-174 or better 1/8" coax runs from the output of Q1 to the input of Q2.

After verification that you have the proper output from the 3866 stage, power up the driver stage of the amplifier only. First, temporarily terminate the 1210 stage with a 50-Ohm resistor. Set the gate voltage to about 3.5 to 3.8 volts for a drain current of 400 mA.

At this point, you could really use two Bird 43 power meters as you want to adjust Q1 for maximum output. I suggest applying only about 11.0 volts to the Q1 stage. Monitor the temperature of the 3866. Adjust the input of Q1, C1, and C2 for minimum swr to the 3866. Once the input is adjusted, the wattmeter is placed in the output of Q1 and adjusted for 5 Watts output. Adjust the 10k gate voltage pot to set the output. See Fig. 8 and Table 1 for plots and data of output versus drain current. Connect the RG-174 coax to the input of Q2 (remove the 50-Ohm resistor load).

The final amplifier is adjusted with the power meter connected to the output of the amplifier. This adjustment is easier than the lower stages as we have no concern with swr when using VMOS. Just adjust C5, C6, C4, and C15 for maximum output. Apply operating voltage and adjust gate voltage for proper quiescent drain current and power output. And, yes, the 2N3866 transistor still operates linear unless it gets very hot.

At 400 or 500 mW, I still recommend the small heat sink; 400 mW runs very cool and is sufficient to drive the amplifier to its full nominal output of either 40 or 60 Watts depending on the output transistor chosen.

VMOS Power Amplifier

I am so enthused by the improvement of MOS power operation over that of bipolar transistors and, yes, even to that of vacuum tubes that I predict that within the not-too-distant future we will witness an almost complete replacement of bipolar transistors by the use of VMOS or UMOS technology. From what I understand, UMOS is just an improvement in the MOSFET technology that has evolved into the standard—a vertical planar four-layer semiconductor process called DMOS or double-diffused MOS.

The manufacturer's specification sheets emphasize the following features for VMOS power FETs in the N-channel enhancement: infinite vswr; no thermal runaway; broadband capability; class A, B, C, D, and E; low noise figure; high dynamic range (typical 10 dB); simple bias circuitry; and no problem finding devices to 120 Watts and linear to 500 MHz at 12 and 28 volts. Units of 100 volts to 150 Watts at 175 MHz with 17 dB of gain are also available.

Final Construction Notes

The measurements given for the placement of the shield can be varied. Don't forget to drill holes or notches in the divider shields to accommodate feedthrough wiring, before you solder the separators in place. A nice thing about this type of construction is that should you change your mind for the position of a solder pad once it has been put in place, you can remove it by prying it up with a sharp thin screwdriver. Sometimes it takes a little doing as this glue really holds.

You might at this point note that RY2 and RY3 are both located on the bottom of the low-level transmitter module, while RY1, the antenna relay, is mounted on the power amplifier board in the shielded compartment with the driver transmitter Q1. The relays having plastic cases are held in place with double-backed tape. Yes, it holds very securely.

The Q1 first grounded-gate receiver amplifier stage along with the bandpass filter and the .88-MHz filter are located on the bottom of the converter module. Also on the bottom side are some components of the local-oscillator stage—source voltage filters, the oscillator 12-volt regulator chip, the oscillator bias resistors, the LO inductor, and the C12 oscillator tuning capacitor.

The 12-volt oscillator regulator was used to stabilize the oscillator frequency. It was found that the oscillator frequency would shift a couple hundred cycles if the main power-supply voltage was variably set to 12.5 V, 13.0 V, or 13.5 V—the main supply necessary to supply the voltage and current (power) to the final amplifier.

There is a considerable amount of extra room on the bottom side of this module. The 78L12 regulator chip can actually go almost anywhere thereon. I placed it close to one of the feedthrough capacitors furnishing voltage to the oscillator chain. Like the Q4 oscillator, it also regulates Q5 and Q6 of this chain.

The oscillator chain voltage remains on

during both transmit and receive. Receiver front-end source voltage is removed during the transmit mode, while source voltage to the transmit stages is removed during receive. Refer to the relay circuit for the voltage distribution cycle.

You will note that the first rf stage has the output circuit isolated by a shield. It might be prudent to flip the physical positioning of the two sections as this will shorten the RG-174 coax to a fraction of an inch in length. There has been no problem from this; it just makes a better layout to flip the sections.

Transmitter Low-Level Linear Amplifier

The 13-volt supply line is well-filtered not only in the low-level linear amplifier module, but also through the entire transverter. You may have noted the high quantity of .001-uF capacitors used. These are small disc ceramics with a 100-volt dc rating. All resistors throughout are 1/4 Watt unless specifically shown otherwise.

The low-level amplifier has an output power of 400 mW. The Q12 2N3866 presently has a 10-Ohm resistor in the emitter. This value can be reduced to zero if needed. By shunting a second 10-Ohm 1/4-Watt resistor to that already in the emitter, you can increase the power output to 600 mW. Placing the emitter directly to ground increases the output to 0.8 Watts or 0.9 Watts when feeding the VMOS amplifier input at low swr. If, however, the swr rises, the Q12 transistor will heat up. A small heat-sink hat should be placed around the case.

Tuning Notes

Since the transmitter is more broadbanded than the receiver, it covers the full 4 MHz easily when adjusted at the band center. The receiver will cover the full 4 MHz, but will lose resonance at the band ends. If your greater interests are with OSCAR 10 and single sideband, peak the receiver rf stages for 145 MHz to efficiently cover 144 to 146 MHz. Now, even though there will be some gain sacrificed at the high end, the power of the repeaters in this band segment will overcome the small loss in gain.

If there is anything of question that I have not included, feel free to drop me an SASE with your comments and questions. I am quite sure that once involved with this project, you will find it most enjoyable and will discover the real rewards of operating in any mode. ■

References

"VHF/UHF World," Joe Reisert W1JR, *Ham Radio*, August, 1985.

"Power FETs: Trend for VHF Amplifiers," Robert S. Larkin W7PUA, *Ham Radio*, January, 1984.

"Solid State SSB Exciter," Robert E. Bloom W6YUY, *73*, December, 1970.

"Design a Toroidal Tank Circuit for Your Vacuum Tube Amplifier," Robert E. Bloom W6YUY, *Ham Radio*, August, 1985.

BIGTIME PACKET

K1TE can control a packet station from his desk or anywhere in the world—with a little help from a mainframe computer.

Bradshaw B. Lupton, Jr. K1TE
227 Maple Avenue
Shrewsbury MA 01545

I fell in love with packet radio the first time I sat down at a terminal and gave it a whirl. The commute time repeater talk gave no hint about thrills available. Protocol, hardware, and software discussions were a big yawn. I spend all day with that stuff. To connect or not to connect, that was the question.

First Time

My first experience with packet was with the Honeywell W1DC 1200 Radio Club TNC-2, 2m rig, and VIP7813 terminal (Fig. 1) during lunch in the club room. KA1MI walked me through the power-up procedures and parameter settings, then explained how to connect to the K1BC and WA1RAJ BBSs (computer bulletin boards accessible only via packet radio). These BBSs are accessible from our Billerica, Massachusetts, plant on 145.090 MHz. The 7813 terminal was exciting because it is one of the series of terminals that my communications software is designed to support. Previously, all I had ever seen on the 7813 terminal was boring old customer-type displays. Numbers, orders, banking, databases, dumps, yucch. Seeing ham calls, satellite info, requests for help, answers to the requests, even ARRL bulletins coming across the screen was too good to be true.

Modem Access

My first challenge was how to make the fun of the lunch hour available outside of the club room. Very fortunately, the 7813 terminal has an auxiliary RS-232 port. Connecting a RIXON 212A modem to the auxiliary port and commandeering the W1DC repeater phone forced me to split my afternoon into two work breaks surrounding some very serious serial communication (Fig. 2). (I have one Honeywell PC, two Honeywell 6/10s with MS-DOS, one VIP7201, three phone lines, four modems, two 9600-baud modem bypasses to network facilities, hundreds of feet of RS-232 cable, and the constant evil eye of the safety committee.) Returning the repeater phone to normal operation left me with an empty feeling.

Neat Stuff

During the time that the TNC-2 was available by modem, I tried hooking up my Honeywell PC with both public-domain and proprietary terminal emulators. I accessed the K1BC board and practiced sending and receiving mail automatically. I sent my first transcontinental mail to NK6K. Three days later I got my response. Electronic mail from MA to CA takes about 6 hours and about 4 hops. Pretty neat for a reliable and FREE service. The modem access to the packet board leads naturally into the idea of modem bypass (just a pair of electronic thingies to turn multiple hundred feet of wire into an RS-232 connection). I approached KA1MVM with the idea of setting up a modem bypass from our largest multi-user mainframe to the packet board. The connection would be a one-way connection to be used by a user logged onto the mainframe. The user would use mainframe connect functionality to the port that is modem-bypassed to the club room.

Mainframe Access

It didn't take too long a sales pitch to get the wires run from the mainframe to the club room. We hooked the modem bypass to the auxiliary port on the terminal, then ran off to another office to dial into the mainframe and see how it worked (Fig. 3). It worked perfectly. The TNC-2 board, 2m rig, and piggyback connection to the 7813 are now accessible from the mainframe. We can connect from the mainframe using the W1DC packet station as a one-at-a-time shared resource.

Security

Once the access was available, KA1MVM (a mainframe system administrator) took

```
USER
 \
  VIP7813------TNC-2------2 METER FM-----PACKET
  TERMINAL      PACKET                   NETWORK
```

Fig. 1. The W1DC packet station.

```
USER
 \
  VIP7813------TNC-2------2 METER FM-----PACKET
  TERMINAL      PACKET                   NETWORK
   \
    MODEM - - - phone line - - - MODEM
                                  \
                                   TERMINAL
                                    \
                                     USER
```

Fig. 2. The W1DC packet station with modem access.

```
USER
 \
  VIP7813------TNC-2------2 METER FM-----PACKET
  TERMINAL      PACKET                   NETWORK
   \
    MODEM BYPASS---------------MODEM BYPASS
                                 \
                                  THE MAINFRAME
                                  COMPUTER
                                 /   \
                             USER     \
                                       PC or CLONE
                                        \
                                         USER
```

Fig. 3. The W1DC packet station with mainframe access.

```
      USER
       \
        VIP7813------TNC-2------2 METER FM-----PACKET
        TERMINAL      PACKET                   NETWORK
         \
          MODEM BYPASS--------------MODEM BYPASS
                                      \
                                       THE MAINFRAME
   ------------------------------------COMPUTER
  /           /           /           /  \
TYMNET       DSA         RNP6        USER  \
|  \        / \         / \                PC or CLONE
|   USER   |   USER    |   USER              \
|          |           |                      USER
|         MINIFRAME   MINIFRAME---
|          /   \          \       \
|    MODEM     USER       USER    MODEM
|     /                             \
|    USER                            USER
|\
| ---DATAPAC (Canada) ---- USER
|
|----PSS (U.K.)---USER
|
|----AUSTPAC (Australia)-----USER
```

Fig. 4. The W1DC packet station with world access.

"We have LANs, WANs, DSAs, RNP6s, SNAs, and tons of other acronyms that can be connected to the packet system."

over the task of collecting copies of the licenses of the hams who wished to participate. The mainframe has B2 security. B2 security is an excellent rating from the standards set by the Department of Defense. The standards rate just how hard it is to break the defenses of the computer. This security is very tight and we feel that it provides more than reasonable protection against improper usage of the packet station. This article has been security screened to make sure that I don't give away the keys to the farm in the process. The mainframe is purposefully not identified. In truth, any of our mainframes or minis or maxi-micros or whatever the marketing types are selling them as can give a connection to a 1200-baud asynchronous 7- or 8-bit line that is perfectly connectable to a packet system. We have LANs, WANs, DSAs, RNP6s, SNAs, and tons of other acronyms that can be connected to the packet system.

Non-Ham Access

To take another step into the bigger picture, we have included the general Honeywell mainframe community into enjoyment of packet radio. Honeywell has "electronic meeting" software that allows any number of people to participate in an ongoing meeting resident on the mainframe. You attend the meeting at any time you wish while logged on the mainframe. You can enter messages into a meeting in the same way that you leave messages on a BBS. The difference is that there can be hundreds of different meetings and topics available on the mainframe, as opposed to the single "meeting" on the BBS. Also, the BBS has many selective messages directed from one ham to another, while the "electronic meeting" is available to all who attend. Here on our mainframe we can connect to the packet system in such a way as to capture a file containing all the information that went by the screen. After disconnecting from the packet board, we can edit the "capture file" and place annotated sections into the "W1DC electronic meeting" for all to enjoy. Our "electronic meeting" on the mainframe is the place to air problems, resolutions, general bulletins, club information, etc., for ham and non-ham alike to enjoy.

World Access

The present/future configuration of our world access plan is shown in Fig. 4. Our mainframe is accessible by a variety of network connections. TYMNET is a paid public network connection that provides character-by-character transfer from a remote user at a terminal to and from the mainframe computer. The TYMNET user can be anywhere in the USA or possessions and use a modem to dial a local telephone number in the nearest major city (and many minor ones as well). TYMNET is merely acting as the carrier of the data in much the same way as the phone company is acting as the data carrier if you convert your data into sound with your modem.

Bigger Picture

Stepping back even further: TYMNET is connected with similar paid public networks in major countries worldwide. I have used DATAPAC in Canada and PSS in the U.K. to access the mainframe during business trips. On my next business trip I will have the choice of accessing the W1DC packet station from anywhere on earth. The paid data networks will transport my keystrokes from my distant earthly location to beautiful downtown Billerica, Massachussetts. If I choose, I may use the mainframe connect function to pass my keystrokes to the piggyback connection on the VIP7813 terminal in the club room at the top of the tower building.

Piggyback

The piggyback connection is a really neat thing in itself. If I am in Timbuktu, going through this monster connection, connected to the auxiliary port of the 7813, I can work in parallel with the local operator. What he types, character by character, appears on the local screen AND on mine in Timbuktu. What I type he sees. Actually, the character I type travels the entire route to the packet board where it is echoed back. The echoed character goes to the local screen AND out the auxiliary port, over hill and dale, to my screen. It is easy to double...I can obliterate what the local operator is typing. This is handy for interrupting and asking the local operator a question. The line can be deleted and it will never go out over the air. This is handy for changing frequency on the 2m rig from 12,000 miles away.

Legally Speaking

I maintain that this world access network is proper and secure use of amateur radio. The mainframe is manned 24 hours a day, 365.25 days per year. The station can be shut down from a number of locations along the path. Foremost, the operator at the keyboard IS in control, as certainly as if he were at the local keyboard. In the event of network failure, the security department is a phone call away and can yank the power to the packet room. Even though a non-ham is pulling the plug, it is at the express direction of a licensed amateur. This is wonderful stuff if used in the right spirit.

K1TE Philosophy

I was won over by the concept of "electronic meetings" on the mainframe long before I encountered packet radio. I found a great deal of fun and help available by both reading meetings and asking questions in those meetings. If you have a question, ask it. Let the question ferment a couple of days on an "electronic meeting" or BBS and see what comes of it. Maybe it needs rewording. Maybe you will be given a thread of the answer to follow to another place. There is a lot of information available from a lot of sources worldwide, and packet radio is a terrific way tap into it. ■

BARTER 'N' BUY

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 80-page catalog, $5. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90815. BNB045

MARINE RADIO: Marconi Canada CH-125 synthesized AM/SSB transceiver, 22 channels on 4, 8, and 12 MHz, 125 Watts, 12 V dc. Never used, list $1,995, asking $1,495. Stu Norwood, 70 Rte. 202 North, Peterborough NH 03458. BNB047

QSLs to order. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

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RADIO TRANSCRIPTION DISCS WANTED. Any size, speed. W7FIZ—WG, Box 724, Redmond WA 98073-0724. BNB347

XEROX MEMORYWRITER—parts, assemblies, boards, manuals. Free help with service problems. W6NTH, Box 250, Benton AR 72015; (501)-776-0920. BNB404

HAM TRADER YELLOW SHEETS, in our 24th year. Buy, swap, sell ham-radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. $12 for one year (24 issues). PO Box 2057, Glen Ellyn IL 60138-2057. BNB412

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FIND OUT what else you can hear on your general-coverage transceiver or receiver. Join a shortwave radio listening club. Complete information on major North American clubs and sample newsletter $1. Association of North American Radio Clubs, PO Box 462, Northfield MN 55057. BNB464

WANTED: Old Western Electric, RCA, Telefunken, McIntosh, Marantz, Dynaco, Tannoy, Altec—tubes, amplifiers, speakers. Maury Corb, 11122 Atwell, Houston TX 77096; (713)-728-4343. BNB479

LEARN CODE on your IBM PC (or compatible), Commodore C-64/128, or Macintosh. CODE-PRO takes you from no knowledge to proficient copy. Specify computer. $10 plus $2 s&h. Trio Technology, Dept. 861, PO Box 402, Palm Bay FL 32906. BNB490

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HOME-BREW PROJECTS LIST. SASE WB2EUF, PO Box 708, East Hampton NY 11937. BNB509

VIDEOCIPHER DESCRAMBLING MANUAL—115 pp.—$27.45 ppd. Oak Orion—77 pp.—$22.45 ppd. Satellite catalog $2. Microtronics, PO Box 2517-L, Covina CA 91722. BNB513

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $10. LEARN MORSE CODE IN 1 HOUR. Amazing new supereasy technique! $10. Both $17. Moneyback guarantee. Bahr, Dept. 73-3, 2549 Temple, Palm Bay FL 32905. BNB517

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QSLs, QSLs, RUSPRINT QSLs. Quantities of 100, 200, 300, or more. Full color Old Glory and cartoon. Also Parchment, Golden Eagle, and others. SASE appreciated. Rusprint, Rte. 1, Box 363-73, Spring Hill KS 66083. BNB532

NI-CD BATTERIES AA/AAA $1.50 (W/Tabs &1.65) each. 7-cell replacement pack to fit ICOM BP-3 case $14.95 each. Cells for BP 2-5&7 $2.40 each. Yaesu FNB-2 "Clone" Pack $22.95 each. PA residents add 6%. Add $2.00 S&H/order. Others available, write: CUNARD ASSOCIATES, R.D. 6, Box 104, Bedford PA 15522. BNB557

HAM RADIO REPAIR, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128; (408)-729-8200. BNB558

NEW, UNIQUE LOGGING AND CONTEST PROGRAMS for the Commodore C-128. Fast, generalized sort and print. SASE for description; $24.95 for the package. Dave Kirk KY3J, 1914 Yardley Road, Yardley PA 19067. BNB559

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THE DX BULLETIN provides you with comprehensive, up-to-date DX information and much more. SASE or call for samples. Box 4233W, Santa Rosa CA 95402; (707)-523-1001. BNB565

1987 "BLOSSOMLAND BLAST" Sunday, September 20, 1987. Write "Blast," PO Box 175, St. Joseph MI 49085. BNB569

WANTED: EQUIPMENT AND RELATED ITEMS. THE RADIO CLUB OF JUNIOR HIGH SCHOOL 22 NYC, INC., is a nonprofit organization, granted 501(c)(3) status by the IRS, incorporated under the laws of the state of New York with the goal of using the theme of Ham Radio to further and enhance the education of young people. Your property donation would be greatly appreciated and acknowledged with a receipt for your tax-deductible donation. Please contact WB2JKJ through the *Callbook* or telephone (516)-674-4072, 24 hours, seven days a week. Thank you! BNB570

CARDS. Free samples. Cards printed on glossy white stock. Ken WA9HGE, 1075 W. 11th Street, Hobart IN 46342. BNB574

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THE ORIGINAL HAM SACK. Deluxe soft padded case for all popular handhelds with battery packs. Three zippered compartments for radio, antenna, and accessories including spare battery pack. Belt loops and detachable shoulder strap. Tough Dupont Cordura™ nylon. We are hams and we *know* you will like this case. Full refund guarantee. $12.50 includes shipping.

Frank & Linda Reed KC1DM & N1EUR, 15C Daniel Webster Dr., Hudson NH 03051. BNB580

SB-220 OWNERS!—Enhance performance—add new features. 11 step-by-step mods which include: tuned-input 6- and 160-meter operation, heavy-duty power supply mods, full QSK operation, solid-state bias control, and many more. Source of parts included. One time 50% rebate for new mods submitted and two free updates. 10 pages of tech info on the 3-500Z. Order today—$10 per copy plus $1 postage. SASE for info. Bob Kozlarek WA2SQQ, 69 Memorial Place, Elmwood Park NJ 07407. BNB581

AEA PK-64 Packet Controller. New. $170 or trade for MFJ-1274. W5CE 5124 Walden Mill Dr., Norcross GA 30092; 404-447-9060. BNB582.

ATARI PACKET PROGRAM—Connect any TNC having TTL serial port directly to your Atari. No 850 interface needed. Works great with Kantronics and MFJ. Features disk and printer capability. Cartridge $35 Disk $15. Electrosoft, 1656 South California St., Loveland CO 80537. BNB583

WANTED: SCR-511/BC-745. Commonly called CALVARY unit or POGO STICK, MILITARY Radio. Will pay Top Dollar and finder's fee. Contact Bill, Rt. #3 Box 200B, Selbyville DE 19975. BNB584

MORSE CODE COACH—IBM PC. 32 lessons included, create and save more. Random code groups also. Novice to Extra speeds. Practice at 16-wpm rate spaced to speed, or test at speed. Menu-driven with Help. Basic—source included. Send $15 for floppy. G. Leedom KB6NKC, Rt. 5, Box 441, Chippewa Falls WI 54729 BNB585.

SPECTRUM COMMUNICATIONS SCR1000 2m repeater. Wacom Duplexer WP-639. Operational, crystals, manuals, schematics, clean. $1850. Milton Onaga KH6US, PO Box 6122, Kahului HI 96732-8922. BNB586.

COMMODORE REPAIRS. We are the largest service center in the country and we repair Commodore computers within 3–4 days. Our prices are low: e.g. C64—$39.95. Toll Free 800-642-7634 (outside NY), or 914-356-3131. Kasara Microsystems, Inc., 33 Murray Hill Dr. Spring Valley NY 10977. BNB587

WANTED: TCS receiver and transmitter, cables, speaker, power supply, all or part. Ronald Percy, 1242 Pleasant Valley Dr., Catonsville MD 21228; 301-747-0794. BNB588

WANTED: Lafayette PrivaCom 3C, 525, 625, or GE 5813B. RADIO, 2053 Mohave Dr., Dayton OH 45431. BNB589

CHRISTIAN INVESTIGATOR NET Write N9FAQ Blau, 1127 West Hwy 20, Michigan City IN 46360. Three stamps, please. BNB590

STAMP-COLLECTING HAM wants foriegn stamps and stamped envelopes. Donna Kappenman KE0HP, 516 Melrose, Souix Falls SD 57106. BNB591

SPECIAL EVENTS

COBOURG 150TH
JUN 22–JUL 5

The Heritage ARC will use the special prefix VX3 from June 22 to July 5 to commemorate Cobourg's Sesquicentennial. Operation will take place in a section of the art gallery in historical Victoria Hall in Cobourg, Ontario. CW operation will be on 3.550, 14.050, and 21.025. SSB operation will be on 3.800, 14.143, 14.200, and 21.250. RTTY operation will be on 14.180. Two-meter operation will be on 146.550. Special QSL cards have been printed, and it is planned to exchange greetings with Coburg, Australia; Coburg, W. Germany; and Coburg, Oregon.

MOFFETT FIELD CA
JUL 3–5

The Naval Air Station (NAS) Moffett Field, in cooperation with the NASA Ames Research Center ARC, will be operating a special event station during the annual NAS Moffett Field Open House this year. The dates are July 3–5, 1987 and the station, K6MF, will be on the air from 1600 UTC to 0100 UTC all three days. K6MF will operate on 14.280 MHz and 21.380 MHz, voice (A3) only. Special QSL cards are being prepared for the event. Send an SASE to: AARC, PO Box 146, Moffett Field, CA 94035. For more information, contact David Brocker WB6YGN—AARC President, 233 Barbara Dr., Los Gatos, CA 94035; (408)-377-9345 or (415)-694-5536 (days), or Mike Hastings KB6LCJ—Event Chairman, 2681 Barcells Ave., Santa Clara, CA 95051: (408)-243-6745 or (408)-744-5551.

CORNELIA 100TH
JUL 4

The Southern Piedmont ARC will operate WD4NHW on July 4 in celebration of the centennial year of Cornelia, Georgia, Home of the Big Red Apple. Listen for operation in the 20-, 40-, and 80-meter bands. For a certificate, send your QSL card and a 9" x 12" SASE to SPARC, PO Box 52, Cornelia GA 30531.

RIVERBOAT DAYS
JUL 4

The Clinton ARC will operate special-event station WØCS on July 4 to commemorate the Clinton, Iowa, Riverboat Days. Suggested frequencies: CW—3.720, 7.120, 21.120, and 28.120; phone—3.875, 7.275, 14.275, 21.375, and 28.400; 2-meter FM—146.460; 2-meter SSB—144.210. To receive a certificate, please send a #10 SASE to Darryl Petersen KDØPY, RR #1, Box 84, Bryant IA 52727.

FESTIVAL OF NATIONS
JUL 4

The Chatham Kent ARC will operate VE3CRC on July 4, from 1200–2200 UTC, to celebrate Chatham Ontario's Festival of Nations. Phone and CW on 80–10 meters, packet and phone on 2 meters. Certificates for a QSL card to Cliff Russell VE3NGG, R.R. #1, Chatham Ontario N7M 5J1.

HARRISBURG PA
JUL 4

The Harrisburg RAC will sponsor the 15th annual Harrisburg Firecracker Hamfest on July 4 at the Bressler Fire Co. picnic grounds near Exit 1 of Interstate 283, midway between the Pennsylvania Turnpike and Interstate 83. Follow PA 441 N and signs to the site. Tailgating at no charge with $3 admission. XYL and kids free. VE exams will be held nearby starting at 9 a.m. Talk-in on .52 and .16/.76. For additional details and table reservations, contact Dave KC3MG, 131 Livingston Street, Swatara PA 17113; (717)-939-4957.

STATER BROS. CELEBRATION
JUL 4

The Valley ARA will sponsor a special-event station at the Stater Brother's "Happy Birthday U.S.A. Celebration" in Staunton, Virginia, on July 4, from 8 a.m. to 8:30 p.m. on 14.250, 3.850, and 7.230 MHz. A 9 x 12 SASE is required for a special certificate. Mail to N4ICT, PO Box 1091, Staunton VA 24401.

WILKES-BARRE PA
JUL 5

The Murgas ARC will sponsor its 8th annual Hamfest and Computerfest on July 5, beginning at 8 a.m., at the Ice-A-Rama, Coal St. Sports Complex, Coal Street, Wilkes-Barre, Pennsylvania. Donation: $3; XYLs and children under 16 free. Outdoor tailgating: $2, bring your own table. Indoor selling: $8 per space, includes a table, but please reserve in advance. FCC exams given at 10 a.m. Talk-in on 146.61, 53.61, or 146.52. For more information, contact K3SAE, KB3GB, RD. 1, Box 214, Pittston PA 18643; (717)-388-6863.

NATIONAL SOARING CHAMPIONSHIPS
JUL 5–12

From the new National Soaring Society Headquarters, the State Line ARC will operate special-event station KT5I to celebrate the 1987 National Soaring Championships (open class). Operation will be on all bands from 10–80 meters on July 5–12. For a large certificate, send OSL and contact number to State Line ARC KT5I, PO Box 1423, Hobbs NM 88240.

MONTEREY CA
JUL 7–9

The Naval Postgraduate School ARC (K6LY) will operate a special station aboard the *USS Missouri* (BB-63) during "Fleet Week Monterey," in conjunction with the celebration commemorating the Great White Fleet journey of 1907–1909. Special event is set for July 7–9, 1700Z–0100Z. Suggested frequencies are the lower 50 kHz of 20 and 15 meters for phone and the Novice portion of ten meters. A commemorative QSL card will be available. Send QSL and SASE to NK6H, 96 Cuesta Vista Drive, Monterey CA 93940.

EAU CLAIRE WI
JUL 11

The Eau Claire ARC will hold its annual Hamfest on July 11, from 8 a.m. to 2 p.m., at the 4-H buildings on Fairfax Street (behind Highland Mall) in Eau Claire, Wisconsin. Tickets: $2 in advance, $3 at the door. Free tables. VE tests given from 9 a.m. to 1 p.m.—all walk-ins. Talk-in on 147.84/.24. For information/tickets, send an SASE to Gene Lieberg KA9DWH, 2840 Saturn Avenue, Eau Claire WI 54703.

PETOSKEY MI
JUL 11

The Straits Area ARC will hold its Swap and Shop and Computer Demonstration on July 11, from 9 a.m. to 2 p.m., at the Petoskey, Michigan, Fairgrounds. Donation: $2.50 at the door. 8' table: $3, splits allowed. Talk-in

on .52 and .07/.67. For further information, call (616)-347-8693 or (616)-582-7322.

POUGHKEEPSIE NY
JUL 11

The Mt. Beacon Hamfest will be held on July 11, from 8 a.m. to 3 p.m., at the Arlington Senior High School, Poughkeepsie/Lagrange, Dutchess County, New York. Admission: $3. Tailgating space: $4 (one free admission). Table: $6 (one free table and admission). Talk-in on 148.37/.97 and 146.52. For additional information, contact Julius Jones W2IHY, RR2, Vanessa Lane, Staatsburg NY 12580; (914)-889-4933.

MAPLE RIDGE BC
JUL 11-12

The Maple Ridge Hamfest will be held on July 11-12 at St. Patricks Center, 22589 121 Avenue, Maple Ridge, B.C. Admission: hams, $6; non-hams over 12, $3; under 12, free; two hams in family, $9. Talk-in on 146.20/.80 or 146.34/.94. For more information, write to Floyd Beardsell VE7HI, Box 292, Maple Ridge BC V2X 7G2.

BUNSEITH NO
JUL 11-12

The 24th International Hamfest and Computerfest will be held on July 11-12 at the International Peace Garden between Dunseith, North Dakota, and Boissevain, Manitoba. Free space for vendors and flea market. Talk-in on .52. For more information, write NTARC, Box 2002, Minot ND 58702.

INDIANAPOLIS IN
JUL 11-12

The 17th annual State ARRL Convention and Hamfest will be held on July 11 and 12, beginning at 6 a.m. both days, at the Marion County Fairgrounds in Indianapolis, Indiana. Gate fee is $5. Children under 12 free. For information on inside flea market space, call (317)-356-4451. For information on commercial building space, call (317)-745-6389.

LAKE CANTON FIELD DAY
JUL 11-12

Oklahoma amateur radio operators will conduct their fourth annual Field Day exercises on July 11-12 at Lake Canton, Oklahoma in the "Big Bend" picnic shelter. Activities begin at 2 p.m. on Saturday and continue till noon on Sunday. The Lake Canton Field Day is held in conjunction with the annual IARU "Radiosport" DX Contest. Talk-in on 146.52 or 144.85/145.45. I-40 travellers should use 146.01/146.61. The Lake Canton Field Committee will provide a commemorative certificate for contacts with event stations WD5HPU, WA5LTM, and other amateur stations that officially operate from Lake Canton during the event. Operation will be in the General phone portions of the 40-10-meter bands and on 6- and 2-meter SSB. For a certificate or additional information, send QSL and large SASE to Tim Mauldin WA5LTM, Lake Canton Field Day, PO Box 19097, Oklahoma City OK 73144; (405)-521-5048.

HOLMDEL NJ
JUL 11-12

The Holmdel ARC will operate K2DR from 1500Z to 2200Z on July 11, and from 1500Z to 2000Z on July 12, to commemorate the 25th anniversary of of the launching of the TELSTAR communications satellite. Operation will be in the lower 25 kHz of the General 20-, 40-, and 80-meter phone bands (check at 15 minutes after the hour), and on 146.55 and/or 145.64 MHz FM. For certificate, send QSL and SASE to Holmdel ARC, PO Box 205, Holmdel NJ 07733. For more information, please contact Vincent Passione WA2ECP at (201)-957-3486.

BATTLE CREEK MI
JUL 11-17

W8DF will be operated as a special-event station from July 11-17 at the Battle Creek International Hot Air Balloon Championship. The station will operate on (SSB) 3.890, 7.240, 14.250, and (CW) 7.040 and 14.040. For a 9 x 12 certificate, send a large SASE to SMARS, PO Box 934, Battle Creek, MI, 49016. For more information on the event, write to the same address.

NORTH HILLS PA
JUL 12

The North Hills ARC will hold its 2nd annual Hamfest on July 12 at Northland Library, Cumberland Road, North Hills, Pennsylvania. Free admission and free vendor space (bring your own table). Amateur exams will be given; walk-ins welcome. Talk-in on 147.69/.09. For more information, call Bob N3DOK at 367-2393 or Rey W3BIS at 828-9383, or inquire on the 147.69/.09 or 146.28/.88 repeaters.

DOWNERS GROVE IL
JUL 12

The DuPage ARC will hold a Hamfest-Computer Show on July 12, beginning at 8 a.m., at the American Legion Grounds, 4000 Saratoga, Downers Grove, Illinois. Tickets: $3 at the gate, $2 in advance. Handicap facilities. VE license testing for all classes. Talk-in on 146.52. For tickets or table reservations, send an SASE to Hamfest Chairman, DuPage ARC, PO Box 71, Clarendon Hills IL 60514. For more information, call Ed at (312)-985-0527, Jim at (312)-964-5529, or Everett at (312)-495-1253.

BOWLING GREEN OH
JUL 12

The Wood County ARC will hold its 23rd annual Ham-A-Rama on July 12, beginning at 8 a.m., at Wood County Fairgrounds, Poe Road, Bowling Green, Ohio. Admission is free. Table rental, $7; trunk sales, $3. For reservations, contact Ross Mergenthaler NS8C, 2682 Joseph Road, Pemberville OH 43450; (419)-837-5270—or call Jackie Dicken KA8ZRJ at (419)-352-0856.

PETERSBURG NB
JUL 12

Using the callsign, KC0DA, The Buzzard's Roost Repeater Club will have a special-event station on the air from downtown Petersburg, NB to help the community celebrate their centennial. This event is happening on 12 July from 1500 UTC to 0000 UTC on 3.950, 7.250, 14.295 and 28.375 MHz. Possible CW operation. QSL with SASE to KC0DA, Larry L. Lehmann, 706 West Fairview Ave., Albion NB 68620.

MT CLEMENS MI
JUL 12

Eric NF0O and Allan KA8JJN will operate NF0Q/8 from 1200Z to 2100Z to commemorate the 200th anniversary of the Northwest Ordinance of 1787. This special-event station will transmit on 7.250 and 14.325 as propagation and QRM permit. Secondary frequencies will be 21.350, 28.410, and Detroit area 2-meter repeaters. For certificate, send a large SASE to Eric Koch NF0Q, 2805 Westminster, St. Charles MO 63301.

SPICELAND FREEDOM DAYS
JUL 17-18

The Henry County ARC will operate special-event station N9WB on July 17-18, from 1500-2400 UTC each day, to celebrate "Spiceland Freedom Days." Frequencies: phone—3.870, 7.235, 14.235; CW—3.735, 7.135. SASE for certificate. QSL to HCARC, c/o Civil Defense, 1131 Broad Street, New Castle IN 47362; (317)-521-0582.

GREAT FALLS MT
JUL 17-19

The Great Falls Area ARC will sponsor the 53rd annual Glacier-Waterton International Hamfest at Three Forks Campground on the southern edge of Glacier National Park on July 17-19. Talk-in on .10/.70 and .52. For further information, contact Shirley Smith KC7OA, 1822 14th Avenue So., Great Falls MT 59405; (406)-452-5958.

OAK CREEK WI
JUL 18

The South Milwaukee ARC will hold its annual Swapfest on July 18, from 7 a.m. to 3 p.m., at American Legion Post #434, 9327 South Shepard Avenue, Oak Creek, Wisconsin. Admission is $3 per person. The Milwau-

kee Volunteer Core Group will be conducting amateur radio exams. Talk-in on 146.94. For more details, including a map, write to The South Milwaukee ARC, PO Box 102, South Milwaukee WI 53172-0102.

CONVENTION DAYS
JUL 18–19

The Auburn ARA and the Seneca Co. ARES will operate W2CDS on July 18 and 19, from 1400–2200 UTC, during Convention Days, from the site of the first meeting place for women's suffrage. Suggested frequencies as time and conditions allow: phone—7.250, 14.250, 21.350, 28.350; CW—7.050, 7.125, 14.050, 21.050, 21.150, 28.150. For a certificate, send QSL and large SASE to W2CDS, 2485 Lower Lake Road, Seneca Falls NY 13148.

NASHUA IA
JUL 18–19

Great Plains ARC will operate station KCØCP from 1400Z July 18 to 1700Z July 19, from the site of the little brown church on the vale. Frequencies will be 25 kHz above the lower edges of the General phone bands; FM 146.52 and SSB 144.220. For certificate, send QSL and large SASE to D. Muchow, Box 203, Oelwein, IA 50662.

NAPERVILLE IL
JUL 18–19

The Bolingbrook Amateur Radio Society, in conjuction with the city of Naperville, will be operating a special-event station to commemorate the Revolutionary War. It will be operating from 1400Z to 2100Z on 14.300 and 7.250 MHz ± QRM. For certificate, send QSL card and #10 SASE to: Special Events Chairman, Rich Wayne KE9DE, PO Box 495, Naperville IL 60566-0495.

AUGUSTA NJ
JUL 19

The Sussex County ARC will sponsor SCARC '87 on July 19, beginning at 8 a.m., at the Sussex County Fairgrounds, Plains Road, off Rte. 206. Registration $3. Indoor tables $7 each. Tailgate space $5. For more information, contact Don Stickle K2OX, Weldon Road, RD#4, Lake Hopatcong NJ 07849; (201)-663-0677.

WHEELING WV
JUL 19

The Triple States RAC will hold its 9th annual Wheeling Hamfest/Computer Fair on July 19, from 9 a.m. to 4 p.m., rain or shine, at Wheeling Park, in Wheeling, West Virginia. Admission is $3 in advance, $4 at the door. To reserve space, contact Carl Williams WD8PPS, 9 East High Street, Flushing OH 43977; (614)-968-3652. For tickets, contact TSRAC, Box 240, RD 1, Adena OH 43901; (614)-546-3930.

WASHINGTON MO
JUL 19

The 25th annual Zero-Beaters Hamfest will be held on July 19, from 8 a.m. to 3 p.m., at the Bernie H. Hillerman Park (Washington, Missouri, Fairgrounds). Free admission. Flea market space, $2. Limited covered rental space available. FCC exams. Talk-in on .84/.24 or .52. For more information, contact Zero-Beaters ARC, Box 24, Dutzow MO 63342; (314)-239-2072.

TRAP SHOOT
JUL 23–25

The Inland Empire ARC will operate a special-event station on July 23–25 from 1700–0800 UTC to celebrate the Muscular Dystrophy Associations's Trap Shoot and Chiii Cookoff at Prado Tiro Olympic Shooting Facilities in Chino, California. Theme for the event will be "Shooting for a Miracle." Operating frequencies will be in the General-class portion of the 75-, 40-, 20-, and 15-meter phone bands. The station will also operate in the new Novice and Technician portion of the 10-meter phone band. A certificate will be issued via WA6ZEF when accompanied by a QSL card and a size 10 SASE.

DAVENPORT IA
JUL 24–26

The Davenport Radio Amateur Club will again operate WØBXR during the Bix Biederbeck Memorial Jazz Festival, 1700–2200Z July 24 and 1500–2300Z July 25–26. Operation will be on phone and CW, 80–10 meters, 10 kHz up from the lower end of the General-class band edges. Certificates for your QSL and SASE via Davenport Radio Amateur Club, 2131 Myrtle, Davenport IA 52804.

MARQUETTE MI
JUL 25

The Hiawatha ARA of Marquette County will sponsor the 38th annual Upper Peninsula Hamfest on July 25 at Northern Michigan University. For more information, write to Hamfest Chairman, c/o James F. Jacobson WD8DJA, 105 Raymbault, Marquette MI 49855.

TOPSFIELD MA
JUL 25–26

The Heavy Hitters Hamfest will be held on July 25–26 at Topsfield Fairgrounds, U.S. Rte. 1, in Topsfield, Massachusetts. Hours: Saturday—6 a.m. to 5 p.m.; Sunday—6 a.m. to 2 p.m. Tickets: $4 at the gate or $3 in advance. Children under 12 admitted free if with an adult. Vendors admitted at 5 p.m. Friday night. Send check to Heavy Hitters Hamfest, PO Box 411, Waltham MA 02254. Please include an SASE. VEC license exams given. Talk-in on 146.04/6.64 or 147.885/7.285. For more information, write to Russ Corkum, Jr. WA1TTV, 21 Thorndike Street, Arlington MA 02174.

PORT HURON TO MACKINAC ISLAND YACHT RACE
JUL 25–26

The Eastern Michigan ARC (K8EPV) will commemorate the 62nd Port Huron to Mackinac Island Yacht Race, July 25 and 26. The station will operate from 1400Z to 0200Z each day. Frequencies will be: 3.910, 7.235, 14.235 or 28.335 on phone and 3.710, 7.110 and 21.110 on CW. A certificate will be issued upon receipt of a large (#10) SASE, with your QSL, to K8EPV, 654 Georgia Marysville, MI 48040.

BEAVERTON OR
JUL 25–26

The Willamette Valley DX Club, Inc., of Portland, Oregon, will host the annual Northwest DX Convention on July 25–26 at the Greenwood Inn in Beaverton, Oregon. Registration information can be obtained by writing to the Willamette Valley DX Club, 58731 Columbia River Highway, St. Helens OR 97051.

WEST FRIENDSHIP MD
JUL 26

The Baltimore Radio Amateur Television Society will hold the Maryland Hamfest and Computer Fest on July 26, beginning at 6 a.m., at the Howard County Fairgrounds, Rte. 144 and Rte. 32, adjacent to I-70 in West Friendship, Maryland. Admission is $4. Indoor tables are $20 each along the wall with access to ac power or $10 each in the center of the floor. (Tables must be reserved in advance.) Outdoor tailgating is $5 per space. Accessible to the handicapped. Free walk-in VE exams; no reservations needed. Talk-in on 146.16/.76, 147.63/.03, or 146.52. For more information or table reservations, write to BRATS W3GXK, PO Box 5915, Baltimore MD 21208.

OKLAHOMA CITY
JUL 31–AUG 2

Central Oklahoma Radio Amateur's (CORA's) Ham Holiday and Oklahoma State ARRL Convention will convene July 31 through August 2 at Lincoln Plaza, 4445 North Lincoln Blvd., Oklahoma City. Features includ hi-tech programs and demonstrations, VE tests, the ARRL forum, and other events. The two-day flea market will be open Saturday and Sunday. Talk-in on 147.63/147.03. Pre-registration is $7.00 before July 22. Registration is $9.00 at the door. Flea market tables are $2.00 with pre-registration. For details, write CORA Ham Holiday, PO Box 850142, Yukon OK 73085-0142.

NEVER SAY DIE

from page 10

Perhaps there are some ham psychiatrists (other than Extra class, of course) who could experiment with trying to repair damaged Extra brains and attempt to return them to certifiable sanity. The usual trans-orbital leukotomy approach has, in most cases, rendered what had been a crazy ham into a CBer, which is different, but not necessarily an improvement.

In the early days of amateur radio it was just accepted by the medical fraternity that hams were that way because they'd gotten across the B+ and fried their brains. Now that 12 volts is standard in rigs, we don't get those hefty jolts which fling us across the shack any more, so the code has finally been recognized as the real culprit.

Now, for the good news: Hmmm, I'll let you know if I come across some.

HAMFEST ENHANCING HINTS

The success of a hamfest or convention rests almost entirely on the support of the local amateur community. Though this may seem to be a statement of the obvious, you'd be surprised at how many hamfest committees seem not yet to have figured this out.

I've been attending hamfests for over fifty years now, so I have a pretty good perspective on 'em. For the last 18 years I've been bringing a 2m HT with me and talking over the local repeaters during my visit and a surprising number of the people I talk with always have the same story. Yes, they've heard about the hamfest, but they're not planning on attending.

A well-promoted hamfest will suck every last local ham out of the woodwork. It'll have them coming in from a couple hundred miles around.

A hamfest is show business and should be run by hams with some show business background—not by a telephone installer for Ma Bell. Your hamfest committee is going to have to spend money to make money, so you need someone who is comfortable with planning and using hamfest-sized budgets. You need to draft a local P. T. Barnum for the job, not an accountant.

One of the reasons Dayton does so well is that they've spent years learning how to do it. There's a lot of organizing to a well-run hamfest—the technical program—the Big Name drawing card—prizes—contests and awards—exhibits—ticket sales—advertising/promotion—parking—badges—communications—food concessions—toilets—rain plans—local police liaison—housing—camping and trailers—security—and so on.

The committee has to remember that amateur radio isn't a single hobby—it's a whole bunch—so the hamfest has to have something of interest to DXers, to certificate hunters, packeteers, SSTVers, RTTYers, FM/repeaters, UHFers, contesters, traffic handlers, and so on. Plus groups such as the ARRL, QCWA, OOTC, YLRL, and so on.

Prizes appeal to greed, a common interest of most hams. But mostly you have to convince everyone that they are going to have fun.

Exhibitors can be attracted if they think you're going to have a good solid attendance. You want to make their life as easy as possible, so your exhibit committee should send them brochures and call them. Keep your exhibit prices as reasonable as you can. Are you going to have a big flea market which will keep most of the people out of the commercial exhibit area and send your exhibitors home vowing never to get caught at your hamfest again?

More and more hamfests are coddling exhibitors, recognizing that the larger the commercial exhibit area, the more successful the hamfest. They keep exhibitors happy with coffee and doughnuts—with lunches brought to the booths—a small lounge—with extra help in setting up or taking down the booths—perhaps someone to mind the booth while the exhibitor gets around to see the other exhibits.

Advertising and promotion are the most critical keys to success. This means getting all of the free space possible in the local papers—interviews and news items on radio and local TV. In all of the hamfests I've attended I can't remember one which took advantage of my presence to get added TV coverage. I'm news—did you see the story on page 74 of the May issue of *Success!*? Many computer shows where I've been the main speaker have made sure that I've been interviewed on TV as part of the promotion of their show, but I don't recall a hamfest committee ever thinking of it.

But whether it's me, Roy Neal of NBC, Barry Goldwater, or Owen Garriott, your main speaker should be used to help bring in the local hams and, perhaps even more important, to attract youngsters who might be interested in amateur radio.

"A hamfest is show business and should be run by hams with some show business background—not by a telephone installer for Ma Bell."

I'll bet I get at least one request a week to come to some hamfest and speak. Of course, they explain, they haven't any budget for a speaker, so I'll have to pay my own way and take care of my hotel and car rental expenses. My calendar is busy enough so I keep it on a computer just to keep track. Last year I made over 50 flights to hamfests, conventions, computer shows, electronic shows, seminars, and so on. In the first four months of this year I got to Orlando (spoke), Dayton (spoke), the Las Vegas Consumer Electronic Show (exhibited), the International Tape/Disc Association conference in Hilton Head (where I chaired a seminar on DAT), the Music Business Systems conference in Los Angeles (on a DAT panel), and the National Association of Retail Music in Miami. Coming up are trips to Berlin and Milan for audio shows, Sydney for a board meeting, plus the electronic shows in Japan, Korea, Taiwan, and Hong Kong—CES in Chicago, Hamcom in Dallas, and so on. In addition to that I'm trying to publish some magazines and start a few new ones.

There goes Wayne bragging again, right? No, not at all. My calendar is just as full as the other major ham speakers, so that's what you're up against in trying to get one of us. It's easier to get to a hamfest (if I don't have a conflict) when the hamfest committee makes it clear I'll get some consideration. That means taking care of my travel expenses (and my wife's), a good hotel, a couple of dinners with your most interesting local hams—sightseeing local attractions.

If you want to get the local hams out to the hamfest you have to convince them they're going to have a ball. What kind of short contests can you organize? How about a home construction contest? How about an antenna-measuring contest? How about a fox hunt? How about a code contest with certificates for 20, 25, 30, 35, and higher speeds? Use your imagination and come up with contests. How about a fattest-ham prize? Oldest? Longest licensed? Most outrageous mobile setup? Most ridiculous hat?

The committee setting up the seminars all too often drops the ball when it comes to getting attendees to them. It takes more than a mention in the show guide. There should be posters all around the hamfest showing what events are taking place where. Announcements should be made over the public address system so people won't forget. The more you keep people running around, the more fun they'll remember having. I've had hamfests go to the trouble of getting me there to speak and then keep my talk such a secret than only a couple dozen turn up for it.

Heck, I can't go on for a whole book on the subject right now—but one is needed. There are hundreds of details—like renting commercial HTs for your communications since it's illegal to use the ham bands for a commercial enterprise—and don't give me that non-profit bunk—it's still commercial.

Hamfests are show biz and don't you forget it. As the number of hams dwindles, we need to do everything we can to get those few of us left out for hamfests—and to encourage potential ham youngsters to join our fun. ■

NK6K>PACKET

Harold Price NK6K
1121 Ford Avenue
Redondo Beach CA 90278

ON THE ROAD

This is being written in a hotel in St. Paul, Minnesota, on a rented Compaq computer. "Black Sheep Squadron" is on the tube, the remains of a Domino's Pizza is in the trash can, and the column is, as you might gather, late again. Since the Magnanimous Mr. Green's columnist stipend does not supply adequate funds for the leasing of computers, you can also correctly infer that I've got it for other reasons. A consultant's work is never done.

No paying job can keep the true Dayton Devotee away from the teeming crowds during the last week in April, however, and this year was no exception. Packet was much in evidence, as has been the case in the last few years. The local channel 22 news team even sent out a crew with "interview someone about packet" on their job sheet. I was standing in an aisle, wearing my "I'm A Packeteer" button, and they asked if I knew anything. I was still talking long after they ran out of tape.

Hank WØRLI got the Technical Achievement Award for his work on BBS message forwarding systems. There were several new packet devices and new features for old devices on display at the vendor booths. The packet forums were in two parts again this year, an intro session and an advanced session. For the first time the attendance at the advanced session was larger than that at the intro session. Both had several hundred hams present.

Unfortunately, packet has gotten big enough for some "entrepreneurs" (read sleaze artists) to try to cash in. I saw a $50 replacement for a resistor and a capacitor, for example. Moving on to the good, here's this year's review of packet related items I saw at Dayton '87, in alphabetical order.

AEA

One of the cutest things I saw for packet devices this year has little to do with packet. AEA's programmer, Steve Stuart N6IA, has come up with a lot of nice features for the AEA packet line. This year, he's added FAX receive capabilities to the PK-232. Using the RTTY decoder, giving two shades of gray (black and white), the PK-232 outputs FAX pictures to an Epson-compatible printer. Even in the noisy rf and computer-hash environment of Dayton, the FAX software sent near-perfect weather charts and other FAX data to the printer as they were picked off the air from a general-coverage receiver. I've always been interested in this sort of thing, so I'm hoping AEA takes it the next step and makes it easy to get the image into a computer for manipulation. The addition of FAX makes the AEA multimode TNC more multimode that anyone else's. This will do nothing to counter the only major complaint I've heard about the PK-232, which is that the manual is too big.

The other major announcement for AEA at Dayton this year was a high-speed rf modem (RFM-220). This was one of two commercial high-speed announcements (see also the section on GLB) this year. This is a true rf modem, a data port on one end, and a 220-MHz rf port on the other. The modem uses one-bit-per-baud "straight" FSK. The technical guys say the unit will transmit at data rates from 0 to 19,200 baud, although the initial marketing blurbs mistakenly set the limit at 9600. The RMF-220 uses an ovenized synthesizer and covers all of the 220-MHz band in 5-kHz steps. An oven is a device that keeps a circuit at a constant temperature, reducing temperature-caused frequency changes. The frequency is controllable from the front panel and also through an RS-232 port. All of the standard rf magic words are invoked by this unit, including GaAsFET front end and "multiple helical resonators." TX/RX switch time is less than 10 ms, power output is an adjustable 0–30 Watts.

Although two RFM-220 prototypes were on display, these units weren't quite ready for on-air demos. Availability is "mid-summer." The cost is in the $600 range.

GLB

GLB's big announcement this year was also an rf modem, the NETLINK 220. Two NETLINK radios were on the air and running 19.2k-baud demos to a constant crowd of interested packeteers. The GLB unit also uses straight FSK modulation, and engineers from both GLB and AEA say their units will be able to receive packets from each other. The GLB spec sheet says the bandwidth is 30 kHz. The NETLINK 220 has a crystal controlled oscillator with an oven, and has a digital afc The digital afc (automatic frequency control) tunes the receiver frequency based on the received signal. Two afc circuits are used: one quickly corrects for short-term drift; the other handles long-term drifts. The GLB spec sheet gives a TX/RX turnaround time of 3 ms. They also stress bulletproof rf design in a 3-page fact sheet. Price is $649, available in July or August.

F	List latest 10 message headers with message number.
F*	List all the message headers.
R <n>	Read a message numbered <n>.
W	Send a message. You will be asked receiver and subject. Send <CR> . <CR> or <CR> control-Z <CR> to end the message.
K <n>	Kill a message numbered <n>. A message being read by other station(s) cannot be killed. FO-12 BBS is a multi-user system. Only the originator of the message can kill messages.
H	Help.
Your TNC should be set as follows:	
Protocol	It must be AX.25 version 2. WA8DED PROMs are needed for TNC-1.
	Command TNC-1 : V2
	TNC-2 : Ax25l2v2 ON
T1 timer	6 seconds or longer
	Command TNC-1 : F6
	TNC-2 : FRack 6
Max Frames	2 or 3 is suggested
	Command TNC-1 : O2 or O3
	TNC-2 : MAX 2 or MAX 3

Table 1. JO-12 BBS commands.

HAL

HAL announced the RPC-2000, an IBM PC plug-in card. I didn't get very much information on this one, but it has two packet ports and comes with menu-driven "user friendly" software. Contact HAL for information on availability and price.

Kantronics

Kantronics seemed to be taking a wait-and-see attitude this year, a stance no doubt brought on in part by the failure of their 2400-baud modem to set a standard or see major use. Their "Kantronics News" notes the appearance of level-three networks and high-speed modems. In both cases, the newsletter says that Kantronics will participate in the evolution with products to be announced later. The newsletter also reports a fix for the KAM which kept it from functioning as the TNC on an RLI-style BBS (they work fine for a BBS user). If you are a BBS sysop with a 2.0 version of the KAM software, contact Kantronics for an update.

Kantronics has addressed a long outstanding problem with their product line by incorporating a watchdog timer as an integral part of their recent products, the KAM and the KPC-4. This is a hardware device that keeps a malfunctioning TNC from locking the PTT line and leaving your station on the air for long periods of time. As mentioned in previous columns, if your TNC hasn't got one, add one before using it in unattended operation.

Pavillion Software

You had to look hard to find this next one. I stumbled into it at the Contesters' Forum. I was lured in by a paper written by AK1A with title that mentioned packet as a contest aid. A program called PacketCluster is being used to simultaneously connect a large number of users together for the purpose of exchanging multiplier- and DX-spotting announcements. This program runs on a Kantronics KPC-2, which allows up to 26 users to be connected to a single node (TNC). PacketCluster sup-

ports 25 concurrent users, with the 26th connection used to connect to another node of 25 users. Many nodes may be connected in this way. Spotting reports submitted by a user are sent to all other users on all nodes.

It seems to me that this could also be used by some types of emergency nets, where a small amount of data needs to go to a large number of stations with a high degree of simultaneity. The cost of this package is $59.95. Although I haven't used it and therefore can't recommend it, the idea is very intriguing and worth further scrutiny. I'd like to print a review by one of its users. The address for Pavillion software is PO Box 803, Amherst NH 03031.

Applications

I'm still looking for good packet applications to write about. The Pavillion software PacketCluster mentioned above is one example. Here's another, as described by J. Franklin Fields, Jr. KBØQJ, the president of the OPRA, the Oklahoma Packet Radio Association, Inc. OPRA is in the process of installing a statewide packet digipeater network to function in the event of civil emergencies, especially weather-related ones (as WX seems to be a prime culprit in tornado alley). Much of the funds and equipment will come from corporate donors. OPRA has placed an AT&T 3B2 2MB UNIX V based computer at the National Weather Service Forecast Office (NWSFO). This computer will provide menu-driven access to selected NWSFO information delivered from the NWSFO mainframe in near real-time. The program, written in C, is still in the development process. The nodes will be equipped with the WA8DED/W6IXU NET/ROM protocol to expedite dissemination. An option for the manual targeting of critical information to specific OK County Emergency Operating Centers (EOC) for immediate action will be included.

The total number of planned nodes is 22. However, the nodes now operational are limited to two areas: 5 nodes in eastern OK and 8 nodes in central OK. The two areas are not now linked, but the central nodes are performing beyond expectations. The incorporation of the NET/ROM protocol would greatly enhance throughput even now. This partial system is attracting much attention in Washington DC at NOAA and NWS, and in California at the NWSFO Office of the Regional Director. For more information, contact KBØQJ @ N5JTZ

Space News

Martin G3YJO, Jeff GØ/K8KA, and Mac G8VLY spent three weeks in Pakistan in April setting up two experimental UoSAT ground stations—one at the Punjab University (Lahore) and the second at the Space and Upper Atmosphere Research Commission (Karachi). The stations will provide facilities for students to undertake projects associated with the two UoSAT spacecraft and will be active on the UO-11 Digital Communications Experiment using the amateur callsigns AP2PUL and AP2SUP. Several messages were passed between these two stations and stations in the U.S.

The JO-12 mailbox may have seen its first use by the general amateur community by the time you read this. The following information is from a status report from M. Fukasawa JR1FIG and Tak Okamoto JA2PKI which was received on May 6. Background information on JO-12 can be found in the August, 1986, issue of *73*.

JAMSAT announces the commencement of new operation mode of FO-12. On May 4th, new operation software was released. The new mode allows "On Demand" operation of Mode JD. In this mode, the bird is usually listening, not transmitting. It starts transmitting the mode JD PSK signal at 435.910 MHz immediately after receiving any valid AX.25 frame, including a UI (unproto) frame, through one of four uplink channels, 145.85/.87/.89/.91 MHz. Transmission continues as long as a frame is received once in a three-minute interval. The bird goes back to the listening mode when it does not hear an AX.25 frame for more than 3 minutes.

This "On Demand" operation happens while the bird is in the "ON" period, which occurs every other 2 hours. While JO-12 is in the "ON" period, you will hear 5-second short PSK burst every minute, so that you will know that the mode JD is available and can be switched on by sending some packets to the bird. You will hear nothing while it is in the 2-hour "OFF" period. This new operation mode will become the base of future FO-12 BBS service. A weekly schedule will be determined after enough power usage data for this new mode has been acquired and analyzed.

FO-12 BBS Program Development

The BBS software is running on the JAS-1 engineering model and is being tested by the JAMSAT software team. The first version of BBS program which has limited number of commands will be loaded and tested on FO-12 very soon.

Please keep in mind that this does not mean that the BBS is now available for public usage. While the software team is testing its functions, your attempt to connect to FO-12 (8J1JAS) might fail and you will receive BUSY from it. The first version of the program will have the commands shown in Table 1.

JAMSAT Notes

The callsign of FO-12 which you use to connect is 8J1JAS. The number of messages is limited to 50. If more than 50 messages are posted, older ones will be overwritten. Maximum memory available as message storage is 192K.

There will be no command to logout. Simply disconnect by using the TNC's disconnect command.

Personal mail will not be supported by the first version. Your messages can be read by anyone and you can read messages addressed to someone else.

While BBS is in operation, the digital repeater is disabled. Digipeat request packets will not be accepted by FO-12.

An increased number of users will slow its response and require a longer T1 (frack) time. The maximum acceptable length of the data portion of a packet (PACLEN) is 199. It should be set shorter.

FO-12 transmits at PACLEN=128 and MAXFRAMES=1. This information is preliminary and may be changed without notice.

I'm out of room for another month. I'll have to defer until next month a description of the 56k-baud modem prototype demonstrated by a group of Georgia hams at Dayton. It looks like things are finally on the move, modem-wise.■

ABOVE AND BEYOND

Peter H. Putman KT2B
3353 Fieldstone Drive
Doylestown PA 18901

NEW DIGS

As I write this month's column, we're recovering from the effects of having moved from one state to another over a 60-mile path. All of the things that usually get lost did; most of the things that can get damaged did not (fortunately). I should have suspected that a move was inevitable after spending so much time and effort to remodel my "shack" at my old QTH!

The new location offers more possibilities for VHF and UHF operation, as I now have an acre of land to deal with (as opposed to a city lot of roughly 50 x 150 feet). The township I live in has a very loose antenna and tower ordinance: Essentially, it states that (A) No antenna, dish, or tower can be situated in the front yard; (B) The tower must be set back 1-1/2 times its height from the property line; (C) It must comply with any FAA regulations where applicable; (D) No height restrictions in the general building ordinance shall apply to towers, antennas, or satellite dishes.

Not too hard to cope with! I've elected to install a Tri-Ex W51 crank-up as opposed to a fixed tower. The height fully extended is 51 feet; collapsed, it's about 20 feet. The cranking feature makes servicing antennas a whole lot simpler and adds a safety margin in high winds, a fact not lost on me after the Labor Day hurricane in 1985 did a major realignment of my old 40-foot tower and 15-foot mast. What's that, you say? Can't use hardline with crank-up towers? You're absolutely right. All of the runs on my new tower will be Belden 9913. I am so impressed with this cable that I'm doing the entire antenna array up with it, on 50 MHz, 144 MHz, 220 MHz, 432 MHz, and 1296 MHz as well (using a tower-mounted preamp with the latter to overcome the nearly 6 dB of loss on receive).

After auditing my time spent on VHF/UHF, I concluded that I did most of my contest operation portable and the requirements for operation from the new location were quite modest, so I'll be running about 100–200 Watts per band to single yagis on 6, 2 and 220, as well as a pair of yagis on 432 and an H-frame of yagis on 1296. Transverters will be the signal source on each band, driven from an ICOM IC-740 and a Kenwood TS-430S. Power amplifiers will be solid-state types from Mirage and Microwave Modules, with the exception of my trusty 3CX100 on 23 cm (they're cheap and hard to beat).

As things come along, I'll show a few photos of the new installation so you can get some ideas for your new setups (whatever they might entail). Incidentally, I elected to put all of the operating equipment in a new computer desk/hutch arrangement made from solid oak, which cost me all of $450 in unfinished form. It holds everything perfectly with the exception of the 23 cm amp, which never really fit anywhere neatly in my old shack either. The nice thing about the hutch is the open space behind the shelves for making interconnects. This ensures a neat wiring job but makes tearing the station apart for a portable contest much easier.

Dayton Dept.

Due to the fact that I closed on my house at 3:30 p.m. the Friday afternoon of Dayton, it should seem understandable that I could only spend one day there (Saturday) before dashing home to begin unpacking. But I did get a chance to make a few circuits around the Hamvention and saw many interesting products, to wit: The ICOM IC-575, a dual-band 10m/6m base station in the style of the IC-275 (which I was so fond of a few months back). The IC-375 for 220 was also on display, and I've made arrangements to get review units in coming months. Of course, Micro 2ATs were selling like ricecakes. Where's the Micro 3AT?

Tonna Antennas of France was there in force with every type of yagi imaginable, including new 18-element versions for 902 MHz, which I understand went very quickly. SSB Electronics of Germany was represented as well, showing the old standard LT23S for 1296 (still the best thing on the market for 23 cm to date) as well as the newer LT33S for 33 cm, which I'll also be reviewing in coming months. Kenwood has introduced a new duoband radio for 2 meters and 70 cm (TW-4100A), and these units seem to be all the rage in urban areas. Kenwood also has the counterpart to the IC-575 in the TS-670 for 40, 15, 10 and 6 meters, and offers a nice portable for 23 cm FM with the TR-50. (I was told by Kenwood that when the TR-50s hit the market in California, they couldn't keep them in stock—the orders were that good.)

Everett Gracey of RF Concepts was there with his new line of amplifiers and I must say I'm impressed with the level of workmanship. Although most of the models on display were for 2 meters, I've been told that 220 base and hand-held units are on the way. I will try to get a review of them for you shortly. Everett also showed me a blueprint for a whizbang repeater controller they will have on the market shortly (look out, ACC). Microwave Modules introduced a new 80-Watt amplifier for 220 MHz based on the popular 100HS design for 2 meters. 220 transverters were selling briskly as well.

> *"The 73 Magazine/ICOM Golden Gigahertz Contest sounds intriguing and might be a good way to get a feel for 23-cm operation."*

At the Yaesu booth I was able to find out that yes, indeed, there is a FT-790R MKII in the works for 70 cm, pending type-acceptance by the FCC. Will we see a FT-390R MKII for 220? Sounds like it's a real possibility.

Advanced Receiver Research was on the scene with their line of high-performance preamplifiers and receive converters. I might add that a receive-only converter is a cheap way to check out a band before you jump in with both feet, and they are available for 50, 144, 220, and 432 MHz. When will ARR make a preamp for 23 cm? Only time will tell.

There were plenty of other exhibits that I could only pause momentarily at such as Encomm, Mirage/KLM, Cushcraft, Ten-Tec, and others. The overwhelming conclusion I came to is that there has been an explosion of new equipment and antennas for VHF and UHF operation in the past year, especially in the hand-held radio department. Hand-helds are now available for 144, 220, 440, and 1260 MHz; portable equipment is available for 50 MHz. A bewildering array of accessories confronts the hand-held user, with outboard power amplifiers, "docking" units, and antennas from every manufacturer possible.

73 and I are trying in our limited way to review as much of this material as we can. In coming issues you'll see the ICOM IC-03AT and IC-12AT, the Yaesu FT-109, FT-727, and FT-690R MKII, and the RFC 220 base/mobile and HT amplifiers. No doubt about it–it's truly a buyer's market. Shop around. Ask your friends who own some of these radios. Read the reviews, and you'll do quite nicely. And if you haven't made it to Dayton yet—what are you waiting for?

Contest Update

Bart Jahnke KB9NM writes in to tell of a scheduled portable operation for the *CQ* VHF WPX in July. Nothing unusual about that; lots of folks will be portable. What sets this operation apart is that he and 5 other operators from the well-known W1XX contest crew will be giving out contest points as 4U1UN from the United Nations Building in New York City. Not only that, they'll be on all bands—50 through 2304 MHz—to boot! Ever work a new country on 13 cm? 23 cm? Here's a good chance, especially if propagation is favorable. This operation takes place from the 18th to the 20th. Bart advises that all QSL requests should be handled through: H.A. Bohning W2MZV, 145 Troy Meadow Road, Parsippany NJ 07054.

If you missed the Spring Sprints and the ARRL June VHF QSO Party, there's still time to get on and have some fun. The *73 Magazine*/ICOM Golden Gigahertz Contest sounds intriguing and might be a good way to get a feel for 23-cm operation. Of course, the *CQ* VHF WPX offers something for everyone on VHF. And right behind is the ARRL August UHF QSO Party on 220 MHz and up. Try something different—take your station out in the car, or mo-

bile home, or boat, or up a mountain or tall building, or wherever—there's a way to get a signal on from these places. I'd like to see photos of some unusual VHF operation from readers—something out of the ordinary. How about it?

Odds and Ends

Some folks have asked whether there is a way to prevent severe front-end overload when using a preamplifier ahead of a multimode radio (or even an FM-only transceiver, for that matter). Yes there is, provided you can access the receive line separate from the transmit line. The surplus market abounds with 50-Ohm fixed attenuators at bargain prices. I had a problem where using a GaAsFET ahead of a transverter resulted in too much signal level to the first rf stage—an MRF901 bipolar device—so the solution was to employ a 10-dB fixed attenuator after the preamp and before the transverter.

The preamp was rated at almost 20 dB of gain, so cutting it back to 10 dB resulted in a modest improvement in station sensitivity but retained good front-end performance. The GaAsFET liked driving a steady 50-Ohm load as well! The fix cost all of $3 at a flea market. Such attentuators are not rated to carry much power—typically in the milliwatt region. But they are relatively flat as far as swr goes, in many cases being acceptable up through 23 cm. They have other uses around the shack for measurements and alignment. Do yourself a favor and pick up a couple at the next flea market. Mine are made by Microlab and are rated at 100 mW maximum dissipation.

Here's another odd and end: If you have a 50-MHz radio and would like to get on 220 MHz, you can do it with the Microwave Modules MMT220-28, a new crystal, some #32 enameled wire, and a few minutes of your time. Simply replace the existing 96-MHz crystal with one cut for 85.000 MHz (Series resonant, HC/18-U holder, overtone type). Next, rewind the receive mixer coil to be 12 turns with a 2-turn link in the center. The 2-turn link goes to the 50-MHz receive output, while the 12-turn link goes to the 40822 mixer. Finally, rewind the transmit mixer coil to 12 turns with a 2-turn center link. Either side of the transmit link goes to the 40822 transmit mixers, while the 2-turn link goes to the 50-MHz transmit connection.

It's a simple matter to trim the oscillator in at the 170-MHz doubler frequency (220 − 170 = 50) and repeak the TX and RX coils. If you want, you can install a 27-Ohm, 2-Watt resistor in series with the transmit input and a 33-Ohm, 2-Watt resistor from input to ground, allowing direct drive with up to about 4 Watts. This modification has been used successfully with the ICOM IC-502 and I have tried it with a Yaesu FT-690R MKII with great results.

Pat Bunn N4LTA writes in to tell of a new 50-MHz beacon he's installed on 50.070 MHz. Output power varies from 100 mW to 10 W in three steps, changing every 15 seconds with a 3-second CW note for logging purposes. The antenna is a half-wave halo at 30 feet. Pat advises that he'll send a special N4LTA/BCN QSL card to all those who sending reports (Pat Bunn N4LTA, 171 Spring Lake Drive, Spartanburg SC 29302). See you next month, Above and Beyond. ■

HAMSATS

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STATUS REPORTS

Until mid-May, when AMSAT-OSCAR 10 was returned to active service, satellite activity was slow. The unpredictable scheduling of RS5, RS7, and Fuji-OSCAR 12 did not help anyone in maintaining enthusiasm for the amateur satellite program. This month I will report on the status of our hamsats and follow up with a station review and a fish story.

Radio Satellites

Battery problems continue to plague RS5 and RS7. In spite of this, activity has been very good on both satellites. New stations in the Yukon and Alaska have been on in recent months since the last eclipse period ended in March. The RS5 transponder is excellent. The batteries, however, are completely dead, so it will only operate when the solar panels are illuminated.

RS7, on the other hand, has not only been performing well, but also seems to have some life left in its batteries. The autotransponder has even been activated for some orbits. The autotransponder, or ROBOT, is a computer capable of receiving and logging callsigns it hears on 145.836 MHz. When a callsign is transmitted to the satellite in a specific sequence, the ROBOT will acknowledge the callsign and assign it a QSO number during its response to the calling station. Later, when the proper commands are received from a ground-control station, the ROBOT will dump its list of serial-numbered callsigns. To get a QSL card, you must send for one. The address is: Central Radio Club, PO Box 88, Moscow, USSR.

To contact the ROBOT, first listen for the RS7 telemetry beacon on 29.501 MHz. If the beacon is active, try around 29.341 MHz for a few minutes. If the ROBOT is in operation, you will hear it call CQ in CW at about 18 words per minute. When it's finished, transmit a carrier on 145.835 MHz. If you do not hear a signal coming back on the ten-meter frequency, try tuning the transmit frequency to counter Doppler shift until a steady tone (the ROBOT's carrier) can be heard. When all is ready, call the ROBOT using the following sequence, with your own call inserted appropriately: RS7 DE WA5ZIB AR. The "AR" at the end must be a continuous dit-dah-dit-dah-dit, (no space between letters) otherwise the satellite will completely ignore the transmission. I have found that RS7 prefers uplinked CW at 20 words per minute, but will accept anything from 15 to 35, if it is sent well. A computer or programmable keyer will work every time; a straight key may not work at all unless you have a perfect "fist." A typical response from the satellite might look like this: WA5ZIB DE RS7 QSO NR 123 QSO NR 123 OP ROBOT TU FR QSO 73 SK.

Take care not to hog the ROBOT. Other stations may also be on frequency attempting a contact. Usually when several stations are present, it is a good practice to take turns attempting a contact. The ROBOT can be active alone or simultaneously with the satellite transponder. After a few contacts in the passband, next time listen for the ROBOT before the satellite disappears over the horizon.

The news about RS9 and RS10 has been quite confusing. At the time this column was written (early May) neither satellite had been launched. Some reports have even referred to RS11 as a hamsat soon to be launched. If only one satellite is to go up in the near future, it will likely be RS10 due to its advanced capabilities over RS9. Look to the April HAMSATS column for frequency details, and don't be surprised if the next RS calls itself RS9 even though its band plan looks like RS10.

UoSATs

The University of Surrey in England has been expanding its network of DCE (Digital Communication Experiment) ground stations for packet radio operation through UoSAT-OSCAR 11. The purpose is to demonstrate the usefulness of store-and-forward communications via low-earth-orbit satellites. A single ground station could be linked with a terrestrial packet network to allow message-forwarding to other remote areas not linked via the shortwave bands.

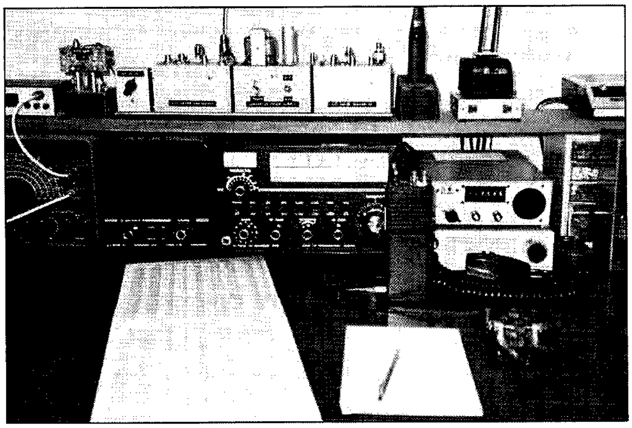

Photo A. The simple but effective WA5RON satellite station.

The DCE is not configured for casual use by any would-be operator, but the benefits will be felt by those with access to packet networks with connections to a UO-11 ground station. DCE activity can be monitored on 145.825 MHz, the two-meter telemetry downlink frequency, when a ground station is receiving messages. Although 4800 baud is in use for some 435-MHz operation, 1200 baud will be heard on the two-meter frequency.

AMSAT-OSCAR 10

After a two-month silence, AO-10 has been released for guarded operation. On May 1st, spacecraft command stations around the world concluded that the batteries needed a few more weeks to recover from the period of low illumination of the solar panels. The IHU (Internal Housekeeping Unit) was successfully reset even though the on-board memory has been heavily damaged by radiation.

As long as the batteries can continue to survive the deep discharge periods caused by uncontrollable satellite attitude, AO-10 will likely continue as a viable hamsat beyond the projected launch date of early 1988 for Phase 3C. In the meantime, we will be required to pay strict attention to operating schedules and uplink power restrictions. This will greatly prolong the life of our most ambitious amateur satellite to date.

Looking back on the attitude predictions presented in April, late June (Field Day!) and early July show a period of 100 percent solar-panel illumination. If all goes well, activity on AO-10 should be fantastic till the end of August, when we'll have to endure another hibernation period. Keep your power down and listen to the AMSAT nets for updates.

Fuji-OSCAR 12

The experiments continue on FO-12. It has been impossible to guess the satellite's schedule of operation. There were a lot of recharge days during April on mode JA, the analog transponder. In May, using a new form of JD (digital) activity, testing began on BBS (bulletin board system) software.

Previously, JD operation included a five-minute on/off cycle embedded in a two-hour on/off cycle embedded in a one-day on/off cycle. The latest change includes "on demand" operation of JD. The two-hour and one-day cycles have been retained, but the satellite only listens when it's on. It transmits on 435.910 MHz when it receives an acceptable AX.25 packet transmission on one of the four uplink channels: 145.85, 145.87, 145.89, or 145.91 MHz. While in the listening mode, a short 2–3-second burst will be sent every minute just to let you know that the satellite is active but hasn't received any packets. This will alleviate the inconvenience of the five-minute on/off cycle while still retaining an adequate charge level in the batteries, since there are no suitably equipped JD ground stations in many parts of the world. Heavy use will only occur over heavily populated areas. When no packets have been received for three minutes, the system will revert to the listening mode.

Development work on the software was conducted using the JAS-1 engineering model and per-

formed by the JAMSAT software team. The first version of the BBS had very few commands since the preliminary tests were to analyze on-board power usage during BBS activity. Enhancements will be added later.

Some TNC-2 parameters should be changed before you try to access the satellite. Set FULLDUP ON, FR 6, MAX 3 and PACLEN 128. To connect to the satellite, type "C 8J1JAS" followed by a carriage return. To get a list of available commands type "H" for help. The engineers are still experimenting, but these BBS commands might work: "R" to read a message, "F" to list the last ten message headers, "W" to write or send a message and "K" to kill a message. Obviously, knowledge of Japanese will not be a prerequisite for BBS work.

No personal mail is supported by the first versions of the BBS software. Your messages can be read by anyone and you can read messages addressed to someone else. As more users access the BBS, system response time will slow. To log out simply perform a normal disconnect. Many changes and system upgrades are expected before FO-12 is allowed to follow any long-term predictable schedule.

Photo B. Fishing and satellite chasing have a lot in common.

Ground Station Profile

For those of you that have not yet attempted any amateur satellite activity, you may be surprised to discover that your station is capable of hamsat communication or at least has most of the necessary ingredients already at hand.

I have had several RS contacts with Ron WA5RON over the last several years. His station does not include any high-cost equipment, but it works. The hundreds of RS QSOs he has made attest to the performance of his equipment. His satellite activities include chasing all mode A satellites for contacts and monitoring UoSAT telemetry and AO-10 activity when signals are good.

For satellite reception, Ron uses a Drake 2-A HF receiver as the heart of the system. An Ameco 6CB6 ten-meter preamp provides the necessary front-end gain for satellite work. His downlink antenna consists of a wire running up through a small hole in the sheetrock and down the length of the attic. A homebrew Nuvistor receive-converter can be used with the Drake for two-meter reception.

On the transmit side, Ron starts with a Santec LS-202A handie-talkie. This little-known rig did not catch on in the marketplace, but provides almost three Watts of LSB or USB output in addition to standard FM operation. A Tokyo Hy-Power two-meter amplifier connects the handie-talkie to a Lunar amplifier at the antennas. With this combination, Ron can select two-meter outputs from one-half to 40 Watts. Ron's antennas include an 11-element Cushcraft rotated only in the horizontal plane or there are various verticals he can use when the satellites are at high elevations. The Santec also provides two-meter FM reception of the UoSATs.

Ron tracks the satellites without a computer. Most of the time he needs simple approximations since just one antenna in the system rotates and only in one plane. Take a look around your shack. You may be on the satellites sooner than you think!

Fishing and Satellites?

While everybody else was up at Dayton hamming it up, I was out on a quiet Texas lake casting for the big one, fish that is. Just what do fishing and satellite chasing have in common? Quite a bit, from the beginner's viewpoint. I am not much of a fisherman. In fact I had only been seriously fishing once before, and that was years ago. I could have gone out by myself and caught a few, if I were lucky, but instead I went in the company of some other hams who enjoy fishing more than radio. The only handie-talkie that went out on the lake was mine.

Where do you go to find fish? When do you go? What kind of fish are you looking for and what equipment and methods work best for catching them? After you catch them, what do you do with them? The list goes on. For me there were a lot of deep mysteries involved. For my companions it was all second nature. The same is true for amateur satellites.

Where are the satellites? When do I listen? What type of satellites are up there and what equipment and procedures work best for hearing them? You can find answers to these questions by reading magazines and books, but the real payoff comes if you can talk to someone who actually operates through the satellites. To be there at his station and actually witness a satellite QSO in progress can make all the difference. Enter the AMSAT Area Coordinator.

I have mentioned AMSAT, The Radio Amateur Satellite Corporation, several times in previous columns, but have not mentioned the all-volunteer group of Area Coordinators. If you have a question about the amateur satellite program, these are the folks to ask. They are available to answer questions, help beginners, give talks at local ham gatherings, offer assistance to local educators, and arrange for AMSAT demonstrations, seminars, and discussions at conventions. There is at least one coordinator in every state. In large population centers there may be more. In Houston there are three.

If you have no idea how to find the nearest Area Coordinator, write AMSAT at PO Box 27, Washington DC 20044. You can also call during East Coast business hours at (301)-589-6062. It's up to you to make the first move. What will it be: over a hundred white bass in an easy afternoon or two catfish for a whole weekend? ■

ATV

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DAYTON RECAP

The 1987 Dayton Hamvention is now history! Friday was a rainy disaster for the flea market but sunny skies prevailed on Saturday and Sunday for busy sales! An estimated 30,000 amateurs from all over the world attended the affair; if you haven't made it out there, you should go—it is a *real* experience! Let me tell you what took place as far as fast- and slow-scan TV and FAX.

We rode out with John Gebuhr WB0CMC of the Greater Omaha ATV System (G.O.A.T.S.—how's that for a name?) We stayed overnight in Indianapolis with his parents and got a chance to visit from the mobile rig with a few of the Indy ATV crowd. We saw the K9LPW ATV/R Indianapolis ATV repeater system in action, though it put out pretty poor strength pictures at a limping 2 Watts of power. The group is suffering from "self-defense" problems that hopefully will be resolved (consider one of WB0CMC's new "super hi-rejection," 15-pole, interdigital duplex filters, fellas).

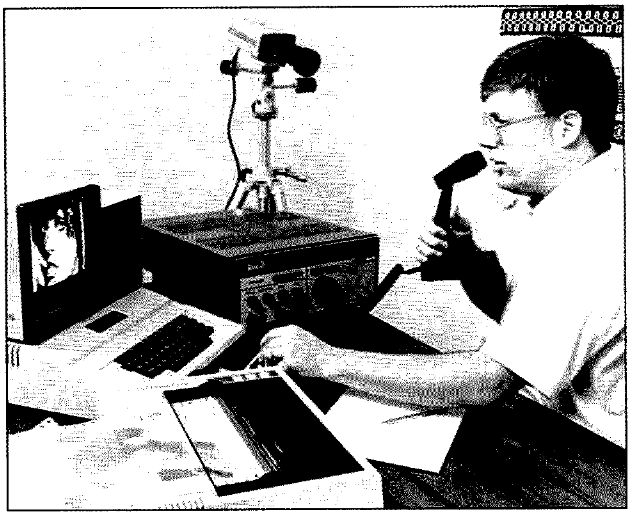
P.C. Electronics unveiled and *sold out* (show stock) of their new 902–928-MHz line of AM transmitter/receivers. Tom W6ORG had built a working display unit of the TXA5–33 system and the TVC-9 downconverter housed in a weatherproof Hammond box. They showed off a newly-available, 1-Watt 70-cm "mini" transmitter unit (KPA5) for those who already have ATV downconverters and just need to add a transmitter. Tom also had his usual array of other ATV components and modules and a few Mirage D1010 amps, all which also sold out on the first day. No new ATV FM gear was available from P.C.

Don W9NTP and Sue W9XL of Wyman Research of Indiana had a booth lined up with all kinds of new goodies! Congratulations, Don, on getting that FM "on-carrier" ATV sound receiver circuit module built up and going for the WR-450 transceiver. The WR-450 now gives the average ATV amateur a choice between the standard 4.5 subcarrier sound or a direct and more powerful on-carrier FM transmitter *and receiver!* The WR-450 rig is now really two systems in one: a 420–450 tunable FM rig and a 420–450 ATV transceiver. Those of you who have worked direct FM-modulating sound systems know that for ATV on-carrier sound is superior to reduced subcarrier sending. The WR-450 transceiver features are not found in any other manufactured ATV system. It is refreshing to see an ATV manufacturer "listening" to the needs of the FSTV consumer and developing such a product! At Saturday night's USATVS workshop session, it wasn't surprising to see a large number of hands go up in the air when Bruce Brown WA9GVK/4 asked who else was using on-carrier sound techniques besides the Washington DC Metrovision ATV Group. The number of hands that were raised for ATV repeater systems that used on-carrier sound, however, was surprising!

W9NTP also had several new ATV additions to his fine line of equipment. The WR-1500 is a small 2.5-Watt (peak) "mini" transmitter with on-carrier sound for only $149.95 or with both OC and subcarrier for $159.95. It features a 10-pin connector that powers the camera, a single-plug camera input, a sync stretcher, and a metal rf-resistant cabinet. This unit, when teamed with the small DC-1 downconverter, makes for a great pair of portable or mobile send/receive units.

Don and Sue also showed off a brand new WR-FM-4912 UHF dual-band (420–450-MHz and 902–906-MHz), switchable ATV receiver unit housed in a Silvernail SE-1a-type cabinet. This receives *both* AM and FM HAM-TV transmissions!

The AM receiver outputs on channel 3 or 4 rf and the FM receiver outputs into a video monitor, with audio. The FM module, which detects the 6-MHz audio subcarrier offset, has de-emphasis circuitry, a lighted tuning meter, and an internal speaker. Price is $374.95. The Wymans also had the new WR-FM-1250 1255-MHz FM transmitter, which has a 5–10-Watt output and uses a 4-MHz crystal-controlled deviation and 6-MHz audio subcarrier. The WR-FM-4912 FM ATV receiver is also available. It tunes 1215–1325 MHz and has the 6-MHz FM audio subcarrier, switchable de-emphasis, GaAsFET front end, and other goodies. For product technical description and picture brochures, write and send SASE to the Wymans at RR#1, Box 95, Waldron IN 46182.



Howard Nurse W6LLO works his Apple IIe computer on SSTV.

John Beanland of Spectrum International had good sales on Saturday and Sunday. His booth displayed the DY-20 900-MHz J-Beams with 17 dB gain, which turned the heads of Tonna owners and prospective buyers. He had 28-, 48-, and 88-element J-Beams and Microwave Module products. John gave one heck of an interesting technical lecture on interdigital filtering at the USATVS Saturday-night ATV workshop session. Communication Concepts, Inc., of Ohio had nothing new to show in ATV gear, as far as I could see. Kinney Software had a booth again this year and Dick was showing off his TRS-80C CoCo and Commodore 64 wares of SSTV low-resolution products. I didn't have a chance to visit with Dick this year, so I don't know if he has anything new.

Robot Research, Inc., of San Diego had a bit better location at the Hamvention™ this year. Hundreds viewed high-resolution 1200C color SSTV pictures. Tom revealed to some persistent amateurs that they were indeed giving serious thought to marketing Robot 1200C kits with the addition of FAX receive and computer printer hard-copy printout. AEA showed off their new PK-232 6-mode interface that now includes FAX. I was a little disappointed that it didn't show the incoming FAX pictures on the TV monitor screen and was limited to printing them out only on the Epson and compatible dot-matrix printers.

The Tom O'Hara W6ORG Saturday afternoon Fast-Scan ATV forum was heavily populated! I counted about 200 or so at the meeting. Tom gave a talk on "Fast-Scan TV Basics." He introduced Gary Heston W6KVC of the former Southern California ATV Club who talked about special events that can be shown on ATV. He showed some aerial pictures of helicopters, parades, etc. He also demonstrated cordless ATV by transmitting the entire meeting on his camera-mounted KPA5 unit. Bruce Brown WA9GVK did an excellent job of explaining the pros and cons of AM vs. FM TV, a subject of hot debate among ATVers recently. He also suggested standards and equipment. His lengthy chapter in the 1987 *ARRL Handbook* is required reading for the ATV enthusiast.

This forum was followed by the Don Miller's SSTV forum meeting. Don introduced Garnet Bebemeyer WB0UNB and Jim Williams, Jr. KC5VC for an IBM PC Robot 1200C show. Samuel Mormino WA7WOD of Interface Systems of Texas was supposed to talk about his new development of a high-resolution SSTV scan converter and was to give a live demonstration, but he failed to show. Attendance at both the Friday night W0LMD/W9NTP and Saturday afternoon forum sessions were low. I counted about 35 people at the beginning of the Saturday SSTV meeting. *Slow-Scan TV is hurting, folks!*

The FAX boys gol three great hours of forum time on Sunday!

Weather Satellites moderator David Latsch introduced Robert Popham of NOAA, who spoke on what would take place in the next 25 years in WEFAX. Dr. Jeff Wallach N5ITU from IBM spoke on building WEFAX stations by using computers. Dr. Grant Zehr WA9TFB gave updates on Soviet satellite monitoring techniques. Mike Mogil of NOAA spoke on weather satellite image interpretation. And Charles Pocius from Northrop spoke on VHF receivers for WEFAX. Unfortunately, again this year, no one addressed the issue of sending FAX pictures and information by amateur radio—a facet which, in my opinion, should not be ignored.

The Friday and Saturday night USATVS/*SPEC-COM* and PARC ATV workshop sessions were well attended with a registration of 84. 16 USATVS state section managers attended these sessions.

At the Friday night USATVS workshop, speakers included: WB0QCD on "The N9CAI ATV/R Super System," WB0CMC on "Omaha ATV/Weather Radar System" and "Duplex Filters for ATVers," W3SST on "Using the Big-Wheel H-Omni Antenna with Cone Shielding for Closer Spacing," N7DOH's "VCR Demo of the New Seattle WA ATV group," and K2KQX on "Simplex ATV Repeater Experimentation." Several VCR tapes were run and reception of the Dayton ATV Repeater was established.

Saturday night workshop session speakers included: WB8ELK on "Helium-filled 80,000-foot ATV Balloon Special Event Project," KB9FO on "Chicago ATV/R Update" and "HAM COPS VCR Production," Bruce Brown on "FCC Matters and Music Docket Comments," and G3BVU on "Understanding Filtering Techniques." ATV mobiles and home-brew projects were judged and prizes awarded.

If you go to Dayton next year and are interested in Fast-Scan TV operations, please plan on attending one of these workshops. ■

FUN!

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Middle Village NY 11379

CONTEST CONFESSION

Okay, you got me. I'm not a big contest fan. I just don't see the point in going after anything that doesn't give me either fun or money.

Call me stupid, call me crazy (and you will), but I can't find any enjoyment in spending an entire weekend yelling nonstop into a microphone or pounding a key. For what? To see my name printed at the top of a list in some ham magazine? Heck, whenever I feel an urge to see my name in print, I just write another article. Writing takes less time and pays better, too. If you want to see your name in print, but can't write, go rob a bank or take your clothes off in the local Shop 'N' Bag. Do anything but clutter-up valuable frequency space.

As you've no doubt gathered by now, I pretty much consider contesting a base form of spectrum trashing. Of course, that doesn't mean I've never participated in a contest. As a kid, I frittered away numerous hours yelling incomprehensible sweepstake exchanges and hammering out section names. But can you imagine an adult doing that sort of thing? Really!

Anyway, I hate cheating, and ham contests are loaded with some of the biggest liars and skunks I've ever encountered. Just who cross-references all of those contest logs anyway? Nobody. Who's listening to hear whether you gave the complete exchange to the other fellow? Nobody, of course.

In most contests, you can pretty much write down whatever contacts you want and win first place without turning on your rig. That way, you can spend your weekend playing ball with the grandkids, tightening the screws on your walker, or catching up on the latest issue of *Modern Maturity*.

What really bugs me is the way contest organizers have commandeered the HF bands, particularly 20 meters. There isn't a weekend remaining in the year that isn't ruined by one sort of on-air activity or another. And the behavior! Heavens! If 2 meters hasn't convinced you that ham etiquette is dead, the behavior of contesters will. And they all supposedly know the code—so much for the "keeping out the riff-raff theory."

Anyway, don't you just love the guys who use the endless-loop tapes? With the reverb? And speech compression? And distortion? Can you imagine what Hiram Percy Maxim would say if he could hear those characters? I'm sure it would inspire the Old Man to find a new application for his famous silencing equipment.

Of course, the current crop of code-based contesters aren't any better than their phone counterparts. Computers have taken all of the romance and skill out of CW competitions. What's the sense of using Morse code, an antiquated two-level encoding system, when a modern, high-level code like ASCII can do the job much better? Well, there is no sense to the situation, of course. A modern-day CW contest is really only a test of microprocessor clock speeds and brute rf energy.

"I pretty much consider contesting a base form of spectrum trashing."

And, speaking of brute rf energy, just how many contesters really pay any attention to the FCC and that silly ol' rule they have about maximum allowable power? Most, perhaps. (I'm optimistic.) But the guys running the Kalifornia Kilowatts and Galveston Gallons are wiping all of the law-abiding contesters out, so I rarely get to hear them.

Messy, messy, messy.

If the ham authorities really wanted to clean up the contest scene, they would try injecting some order into the ranks. Just as sporting events need referees or umpires, contesters require an authority force to patrol their activities. "Radio Umpires," I would call them.

These volunteer minions of the ether would scan contest frequencies—listening only—to monitor the behavior of participants. If a contester were found cheating or somehow disturbing the electronic peace, the radio umpire would have the power to either assess penalty points or to disqualify the offender from the contest. The degree of power vested in the umpires would rest in the hands of the contest organizers. Personally, however, I'd be all for giving the umps capital authority.

To prevent charges of favoritism, cronyism, or impropriety, a Radio Umpire penalty could only be imposed if the infraction were observed by at least two other umpires. (The umpires could be linked together for coordination purposes by a packet network or HF net.) With three or more umpires witnessing a clod's behavior, the hopeless miscreant would have little recourse but to accept the judgment imposed.

Good idea, right? You know, I have the time to dream up such creative thoughts because I'm not wasting my weekends contesting. Yessir.

CQ DX CQ DX DE KI2U. ■

DX

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THE TEN MOST WANTED COUNTRIES

What are the ten most wanted countries by DXers worldwide? Every year *The DX Bulletin* conducts a survey of thousands of top DXers throughout the world to determine which are the rarest countries on the amateur bands. The survey is by far the most comprehensive of its kind, and has been conducted for more than ten years, which provides some historical perspective. Let's have a look at the toughest countries to work and their prospects for legitimate amateur radio activity in the near future (see Table 1).

Note that the information in Table 1 comes from some very experienced DXers; more than 20% of those who returned the survey had worked *all the countries* on the current DXCC list! Another 5% need only Albania to have "worked them all." With only 10% of all DXCC members on the Honor Roll (within 10 countries of working all 317 current DXCC countries, the group that has worked them all is an elite group indeed.

#	Country	Prefix	% Needing
1	Albania	ZA	81
2	South Yemen	7O	75
3	Bouvet Island	3Y	74
4	Burma	XZ	72
5	Andaman Is.	VU4	72
6	Vietnam	XV	68
7	Afghanistan	YA	67
8	North Yemen	4W	65
9	Libya	5A	57
10	Laos	XW	56

Table 1. The Ten Most Wanted DXCC Countries.

"Two of the Ten Most Wanted Countries have been on the air and workable in 1987."

Albania: ZA tops the list of Most Wanted DXCC countries and has for several years. Albania is a country that is hard even to visit, much less operate from. In fact, the operation by DL7FT from Albania that provided many DXers with their only ZA QSL is viewed with as much credibility as some of Don Miller's notorious operations from Maria Teresa Reef and similar spots.

There is a club whose members try to *visit* as many countries as possible—analogous to the DXCC goal of contacting as many countries as possible. Albania heads their list of the most difficult, as well. One member, who has visited most of the 318 countries on the list, was shot at during his attempt to swim to shore in Albania! Shades of Baldur DJ6SI's attempt to operate from Spratley Island.

What are the chances of a legitimate amateur radio operator from Albania? Frankly, they have never been better! Albania has been turning more to the outside world since the death of its long-time Marxist dictator. They have recently finished a railroad into neighboring Yugoslavia, and signed a peace agreement ending their 40-year war with Greece. As the Albanian officials come to realize that amateur radio holds few threats, and offers many benefits, to their backward country, they will allow at least token operation on the ham bands, such as we see from Iraq or Taiwan. Amateur radio in China is a prime example of what can happen in Albania in the next few years.

However, don't hold your breath waiting for the next ZA contact. Nor believe every ZA rumor you hear on the bands. The first legitimate operation from Albania may well be a quick demonstration without advance warning, but it should be followed soon by more extensive operations by locals, and maybe even some DXpedition activity. Keep your fingers crossed, and hope that the Albanian officials soon come to the understanding that ham radio is good for their country.

South Yemen: Number two on the Most Wanted list is South Yemen 7O, which is among a handful of countries that has said officially and in writing that they will not permit any amateur radio activity. The country has nearly been destroyed by a prolonged civil war that has left millions dead and much of the country devastated. Foreigners are viewed with suspicion, at best, and radio gear is always considered to be spy equipment. Most of the recent confirmations of 7O contacts come from "mining" old logbooks for VS9A QSOs from years ago, QSOs that now count for 7O, if the operator is still alive years later and still has the logs and QSL cards.

Bouvet: This Antarctic island ranks third on the Most Wanted list, thanks to the difficulty of landing on the rock and ice. A DXpedition to Bouvet would be very expensive, as the recent Peter I trip ($60,000) and Heard Island trip ($50,000) showed. And there would be considerable personal risk involved. The Peter I Island DXpeditioners may have encountered the best weather in 100 years for their trip. The next group to Bouvet might not be as lucky.

However, there are no political barriers to a Bouvet trip; only monetary and time constraints. It's only a matter of time before someone gets permission from the Norwegians and arranges for the trip. This will probably be a well-publicized DXpedition. (Maybe we can convince the LA DX Group that oprganized the highly successful Peter I trip to have a hand in the Bouvet trip!)

Burma: XZ ranks fourth on the list, and is another country that prohibits all amateur radio activity. Surprisingly, however, several stations are on the air from Burma, with permission from their governments, but they are located in the north of the country, which is still under control of people whom the Rangoon government call rebels. The DXCC desk will accept Don Miller's 1965 operation, despite his propensity for stretching the truth about where he was really located, and the fact that the DXCC desk has a letter from the official Burmese government saying that there has been no legitimate amateur radio operation from the country since 1964! Consistency is not a mark of DXCC accreditation procedures. Don't expect the Burma logjam to break for many years.

Andamans: The best news in the Top Ten is that this long-sought country has been on the air in a major way since the survey was taken in mid-1986! Thanks in part to the fact that the Prime Minister of India is VU2RG, Barathi VU2RBI and other operators have twice travelled to this vacation spot off the Indian coast and put VU4APR and VU4NRO on the air for weeks at a time in early 1987. This should take care of most of the demand for Andamans for a few years. Several other groups are trying to get permission to operate from the Andamans. This one should disappear from the Most Wanted ranks for some time!

Vietnam: XV is another toughie. Since the excellent operations of the late Don Reibhoff XV4AC in the 1970s, we have been without a legitimate XV QSO. Several amateurs travel regularly to Vietnam on business, and they continue to press for resumption of radio activity, but chances are slim for now. Perhaps in a few years this one will open up.

Afghanistan: This is another one of the countries that officially prohibits amateur radio. Since the Russian invasion and occupation, YA QSOs have been nonexistent. Nor is there much hope for any change until the Russians leave. Given the strategic location of the country, that won't soon happen. Another "Don't hold your breath" country.

North Yemen: 4W has been showing signs of opening up to amateur radio in the last year, and DXers are hoping that the trend will continue. Exxon and other oil

companies are actively exploring for oil in North Yemen, and among their exploration crews are several amateurs who are working for official permission to operate in the ham bands. Some of these operators have made QSOs, especially 4W1AA, but none have obtained other than verbal permission, which doesn't cut the mustard at the DXCC desk. Prospects are good here, however; we should see valid QSOs in the relatively near future.

Libya: 5A ranks 9th on the Most Wanted list, and again, we have documented activity from Libya in 1987! Bert 5A0A has been very active on 20 CW and 15 SSB, thanks in part to a rig donated by the European DX Foundation and an antenna from the International DX Foundation. Bert has placed some restrictions on his contacts, especially asking *only* for signal reports—no questions, please—and he is adamant about "insurance" QSOs. If he has worked you before, he'll say so in no uncertain terms and ask you to give another amateur a chance at this rare QSO. His QSL manager SP6BZ (not in the 1987 *Callbook*, unfortunately) has further requested that no callsigns appear on the envelopes to him. But the restrictions are remarkably easy to live with in exchange for a valid 5A QSO. I wonder if Qadafy has any idea that Bert is working U.S. stations? I suspect that he would *not* approve!

Laos: XW rounds out the Top Ten. Laos falls into the same category as Vietnam. They are none too keen on strangers, and ham radios and spy equipment seem indistinguishable. Some time in the future this one might open up to DXpedition or local activity, but I wouldn't count on a legitimate XW operation soon.

The good news is that two of the Top Ten (Andamas and Libya) have been on the air and workable in 1987, and will undoubtedly lose that dubious distinction of being Most Wanted this summer. And two more have a reasonable chance of producing radio QSOs in the near future: Albania and Bouvet. That leaves six toughies, three of which are among the the six countries that prohibit amateur radio. Look for some shuffling in the Top Ten in 1987, but little change beyond the loss of Libya and Andamans.

The best prospects for taking their place on the list? Bangladesh S2, presently #11, will certainly move up unless someone can wrangle operating permission soon. Stations in the United Arab Emirates (#12) are presently on the air, and South Sandwich (#13) might well see activity by the end of 1987. Mount Athos is next on the list; if the Greeks, who stopped the Italians from operating there, don't mount their own DXpedition to SV/A, then maybe we should delete Greece from DXCC! Mozambique, presently #21, stands the best chance of moving up the list, as it is the next country with political prohibition of ham radio, and not mere physical or monetary restraints. Watch for the 1987 *DX Bulletin* survey for the answer! ■

RTTY LOOP

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Okay, CoCo fans, here comes the second barrel, so hold onto your hats, because I'm going to knock your socks off! (Sorry about all the mixed metaphors, but they sure felt good!)

Last month I presented a program for a simple implementation of RTTY on a TRS-80 Color Computer (CoCo). This month, the real blockbuster. Thanks to Dan Downard K4KWT, Technical Consultant and columnist at <*The Rainbow*> magazine, and the Delphi Information Utility, we are able to present one smashing RTTY program here in RTTY Loop.

The program itself, called RTTY1-1.BIN, is a full-featured RTTY program written for the Color Computer by Dan Cobb. Although originally written only for the older Disk Basic ROM, Version 1.0, patches are available to enable its use with the newer Disk Basic ROMs. At this time, I do not have any information about its use with the new CoCo-3.

While the program is of particular interest to disk users, tape interfacing is supported, so you don't have to have a disk, although having one certainly makes operation more convenient.

I guess that the best way to illustrate the capabilities of this program is by looking at the available command set. Here's the RTTY1-1 command set:

From Receive Mode

<CLEAR> Switches to transmit mode. This puts you in the transmit mode and turns on your transmitter. The cassette relay can be used to key the transmitter's push-to-talk line.

<SHIFT><CLEAR> Clears the screen (does not clear receive buffer).

A Auto capture buffer—This allows you to set the program to automatically open the receive buffer when it receives a certain group of characters, and close again when it receives a different group of characters. After you press "A", the program will ask you for the starting characters. Whatever you type here is what the program waits for before it opens the receive buffer. After you have entered the starting characters the program asks for the ending characters. This is what the program waits for before it closes the receive buffer. After you enter the ending characters the program is in the receive mode but the receive buffer is closed. Upon receiving the starting characters the buffer opens. Then when it receives the ending characters it closes again. To exit the "auto capture" mode, press the <BREAK> key.

B Save keyboard buffer. This lets you save the current contents of the keyboard buffer to a disk file. See "M" for entering information into the keyboard buffer. See "R" for file name specifications.

C Clear receive buffer. This clears the receive buffer and resets the receive buffer screen counter.

> ***"This program seems to answer most of the requests the CoCo crowd have been asking."***

D Disk directory. After you press "D" the program will ask for the drive number. Enter the number of the drive of which you want a directory. The program displays the directory in a two-column format. If you want to stop the directory from scrolling off the screen, press the <SPACE BAR>, then press <ENTER> to continue the directory. At the end of the directory the program will display the number of free granules left on that disk. The program also returns to the receive mode after the directory is completed.

E Enter station buffers. There are 10 station buffers numbered 0-9. After pressing "E", press the number of the station buffer you want to enter. Now you can type whatever you want to put in this station buffer. Each station buffer can contain up to 255 characters. When you are finished with this station buffer press the <BREAK> key. The program will store this buffer to disk. Each time you use the program this buffer will be the same, until you change it by entering something new in it. If you press the <CLEAR> key just before you press the <BREAK> key to save the buffer, it will force the program back to receive mode automatically when this buffer is transmitted. When transmitting a buffer that you did not press the <CLEAR> key before ending the buffer, the program stays in the transmit mode until you manually press the <CLEAR> key.

F Freeze receive buffer. This causes the receive buffer to be closed or frozen. You can still see what is being received but it is not being stored in the receive buffer. By pressing the "F" key again, you will reopen the receive.

H Displays help file. This gives you a short explanation for each command. The program pauses between each page. To continue to the next page, press <ENTER>; press <BREAK> to return to the receive mode.

K Kill disk file. By using this command you can kill any disk file. After you press "K" the program will ask you for the name of the file to be killed. After you enter this, the program will ask if you are sure you want to kill this file. You can press "Y" for yes or any other key for no (see "R" for file name specs).

L Transmit line. This function lets you type in a line (up to 255 characters) to be transmitted immediately. After you press "L", type in whatever you want transmitted. When you are finished, press the <CLEAR> key. Then whatever you typed will be transmitted.

+ Retransmit last line. This lets you retransmit the line you transmitted using the "L" command. This should be used only direcly after using the "L" command or it can produce unexpected results.

M Enter message buffer. This lets you type a message or anything else that you want to transmit. The keyboard buffer is about 6000 characters in length. When you are typing into the keyboard buffer the program will give you word wrap-around at 32 characters. While you are typing a message you can use the left arrow to correct any mistakes, but do not backspace past the line on which you are working. When you are finished, press the <CLEAR> key and then the <BREAK> key. The keyboard buffer is now ready to transmit or you can save that message to disk by using the "B" key. Every time you press the "M" key the present contents of the keyboard buffer is erased and what you type will be put at the beginning.

O Set printer parameters. After pressing "O" you can select the number of the option you want changed. The program defaults to 600 baud and 132 characters per line on the printer.

P Print receive buffer or disk file. When you press "P" the program will ask you to get the printer ready and press <ENTER>. After you have pressed <ENTER> you will be given a choice of printing the receive buffer or printing a disk file. Select whichever you want to do at that time. If you select a disk file, you will be asked to enter the file name. Add :1, :2, or :3 if the disk file is to be printed from any other disk drive than drive 0.

Q Quit and return to Basic. This exits you out of the RTTY1-1 program and cold-starts your computer.

R Save receive buffer to disk. This lets you save the current contents of the receive buffer to a disk file. After pressing "R" you will be asked for a file name. This file name can be up to 8 characters long plus a 3 character extention following a / between the file name and the extention. You can also add the drive number you want it saved to. Examples: TESTFILE/DAT or TESTFILE/DAT:1 Both save using the same file name except the first one saves to drive 0 and the second to drive 1.

S Select RTTY speed. Here you can select the RTTY speed you wish to use. After you press "S" the program will display a list of RTTY speeds you can select. Just press the number of the speed you want to use. The following speeds are available: 60 wpm Baudot, 66 wpm Baudot, 75 wpm Baudot, 100 wpm Baudot, 145 wpm Baudot, 110 baud ASCII 7 bit, 110 baud ASCII 8 bit, and 150 baud ASCII 7 bit. The program defaults to 110 baud ASCII 7 bit.

V Freeze video display. This toggles the display of RTTY being received. When you press "V" the first time it freezes the display but any RTTY received is still stored in the receive buffer. The next time you press "V" it will unfreeze the display and continue to display the RTTY being received.

From Transmit Mode

<CLEAR> Returns you to the re-

ceive mode. This returns you to the receive mode and turns your transmitter off if you have enabled the push-to-talk line via the cassette port.

<SHIFT> <CLEAR> Clears the screen.

<LEFT ARROW> Sends a RTTY ID. This sends: DE YOURCALL plus a carriage return.

<SHIFT> <LEFT ARROW> Sends one line of 32 RYs.

<UP ARROW> Transmit disk file. This lets you transmit any data or Basic computer program (saved in ASCII) from the disk. After you have pressed the <CLEAR> key that puts you into the transmit mode you may now press the <UP ARROW> key and the program will ask you for a file name. After you've entered the file name, extention, and drive (if other than drive 0), press <ENTER> and the program will begin to transmit the file you entered. To stop any transmission before it is completed, press the <BREAK> key then the <CLEAR> key.

<SHIFT> <UP ARROW> Transmit keyboard buffer. This will transmit the current contents of the keyboard buffer. You can enter a message in the keyboard buffer using the "M" key from the receive mode. If nothing is in the keyboard buffer, the program will stay in the transmit mode and wait for you to press the <CLEAR> key again.

<DOWN ARROW> Transmit station buffer 0–9. To use this, press the <DOWN ARROW> and the screen will then change to a brighter color. Now press the number of the station buffer you want to send (0–9). After the station buffer has been transmitted, the program will stay in the transmit mode unless you added the <CLEAR> key to that buffer when you stored it to disk, or you must press your <CLEAR> key again.

Impressed? I sure was when I saw this program, which seems to answer most of the requests the CoCo crowd have been asking. Best of all is how you can get a copy of this program for your very own.

I had initially intended to run a Basic loader for the program, similar to the one run last month for the shorter CoCo program. Unfortunately, when I put such a beast together, it was over 700 lines long. I don't think I could ask my editors to publish such a monster, and I seriously doubt if any of you would have the fortitude to type it in.

Therefore, let me tell you how to get a copy. First off, if you are a subscriber to Delphi, it's easy. Log on, go to the CoCo SIG (group coco), and look at the telecommunication data base. There you will find a group of programs, uploaded by Dan Downard, which contain the full RTTY1-1, a.k.a. RTTY64, program. They are available under the heading RTTY/ASCII TERMINAL. Download them and you are set.

For those of you who don't have access to Delphi, Dan has given me permission to distribute the program to you the same way I send out other information. Send me a blank disk, return disk mailer with postage, and two dollars, and I will whip up a copy and send it off to you. On that copy will be all of the files, with a short text file to read which tells you the patches needed to adapt it to the newer DOS chips, how to insert your callsign, and any other patches, bugs, or comments received.

Once again, my sincere thanks to Dan, Delphi, and < *The Rainbow* > for sharing this with us.

I mentioned a few months ago that I have been looking at one of the new "super-box" terminal unit/modem/TNCs. Well, just to let a hint pass, it's made by AEA, and there are at least 232 reasons why I am impressed. Next month, I'll tell you the tale of this remarkable piece of equipment, which I think stands to revolutionize digital communication.

For some reason, plenty of folks are showing a renewed interest in the modes covered by this column. (Maybe it's this column?) I have looked at more than a few books being published, and will see what I have to say about those, too. Sorry about the paucity of letters lately; I wanted to get the information to you about the CoCo programs covered over the last two months, and something had to give. Next month, however, I'll pull out some of the finest received from the USPS, CompuServe (75036,2501), or Delphi (MARCWA3AJR). For now, I guess I'll just submerge myself on this hot summer's day in the ever changing, ever growing world of RTTY Loop.■

WEATHERSAT

Dr. Ralph E. Taggart WB8DOT
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Date	01 July 1987	
Spacecraft	NOAA-9	NOAA-10
Orbit Number	13128	4072
Eq. Crossing Time (UTC)	0138.86	0110.63
Longitude Asc. Node (Deg. W.)	156.85	84.03
Nodal Period (Min.)	102.0851	101.2766
Frequency (MHz)	137.62	137.5

These orbital parameters are projected two months in advance due to deadline considerations. Accumulated errors due to uncompensated orbital decay and other anomalies result in expectation of errors up to two minutes and possibly as many degrees in terms of the crossing data and possible small changes in the indicated period. Users requiring precision tracking data should rely on more current sources.

Table 1. TIROS/NOAA orbital predict data.

PHOTOGRAPHY

This month I am going to answer some of your questions about photographing weather satellite images. First, however, a plea! If you are going to write with questions or anything else where you want a reply, please enclose an SASE. This may seem elementary, but fewer than half the questions I get have that magic stamped envelope enclosed. It is hard enough to keep diligent about replies under the best of conditions, so please give me a break!

Weather satellites represent a highly visual medium, and it is not surprising that we face the problem of how to preserve the images, either for later analysis or just as a permanent record. One of the primary advantages of FAX systems is that they provide such a record as a matter of course. This is especially true of direct printing systems where the picture is immediately available without further processing.

If you are using a CRT monitor or a scan converter, however, the most effective permanent record (and indeed, the only possible record in the case of a CRT system) is to photograph the display. On the surface that is quite simple, but there are many problems that can arise. Basic photography breaks down into two possible approaches—"instant" pictures and the use of roll film.

Instant Photography

So-called "instant" photography boils down to the use of one of several varieties of Polaroid™ film and cameras. While none of the options is truly instant, results are available in anywhere from 15 seconds to a few minutes, depending upon the film/camera system employed. All share two principal disadvantages—a high cost per print and the fact that you are usually limited to a fixed-size format. If speed is all-important, however, you really have to accept these as a fact of life.

Your Polaroid black-and-white options are fairly limited. Of the many cameras the firm has produced, most of the earlier ones were designed to take either color or B/W film packs. You can often obtain a very nice used camera of this type without spending much money.

Be warned, however, that the only older models for which you can easily obtain film are those designed to take Type 106 and Type 107 film packs. Film for previous models, which often used a roll-like format, is almost impossible to obtain. This is a shame since many of these cameras had a wide range of focus and exposure options which were not available on more modestly priced later models.

Almost all the cameras using 106/107 film will require a close-up lens and considerable fiddling with a ground glass or other focusing aid to determine the combination of distance and focus, so that the image will fill as much of the film format as possible. Since all CRT and monitor photography requires close focusing and a very stable camera mounting, you would be well-advised to make some sort of a jig or mounting system to hold the camera rigidly in the proper position for the duration of your exposure.

In the case of a CRT display system, you will have to make exposures ranging from 200 to 400 seconds, during which time the camera lens must stay open. This is easily accomplished with roll film cameras that have a B (use a locking cable release) or T exposure setting, but these are typically lacking on many of the Polaroid models.

You can obtain or fabricate a system to add a locking shutter-release cable to such cameras, but you will need some way to override the automatic shutter timing. On many models this can be as simple as a piece of black tape over the electric eye, which causes the shutter to remain open until released.

Most of these cameras also require batteries of varying voltages, some of which can be hard to obtain. This should not deter you, for you can simply wire into an external battery of any size since you won't be toting the system around!

In the case of a CRT display system, proper exposure must be obtained by adjustment of the brightness and focus since the exposure time is set by the image frame period and most of the available cameras do not have an adjustable iris. If your prints are too dark, you will have to increase brightness and/or remove any CRT filters you might be using. If the prints are overexposed (very light to white), you can use fancy neutral density filters (or lenses from an old pair of sunglasses) to reduce the light reaching the camera and thus achieve proper exposure at something close to normal monitor brightness levels.

When photographing a TV monitor used with a scan converter, you can often use the built-in camera exposure control and adjust fine exposure with the "lighten/darken" controls.

All of the preceding discussion has assumed that you are using one of the idiot-proof cameras. The company does make cameras for industry and professional use that have manual exposure and iris control. If you can obtain one at an acceptable price, its operation will be more akin to roll film cameras discussed below. The same is true of larger format professional cameras that are available with Polaroid backs.

I should also note that the company has a variety of professional films, some of which will produce a negative in addition to the "instant" print. Such films are more expensive and harder to obtain for many, but at the expense of some additional handling to fix the negatives, they offer the possibility of making additional prints if a large format (typically 4 x 5) enlarger is available.

The newer line of SX-70™ cameras requires the use of color film, but presents many of the same operational problems already discussed. You will find it much

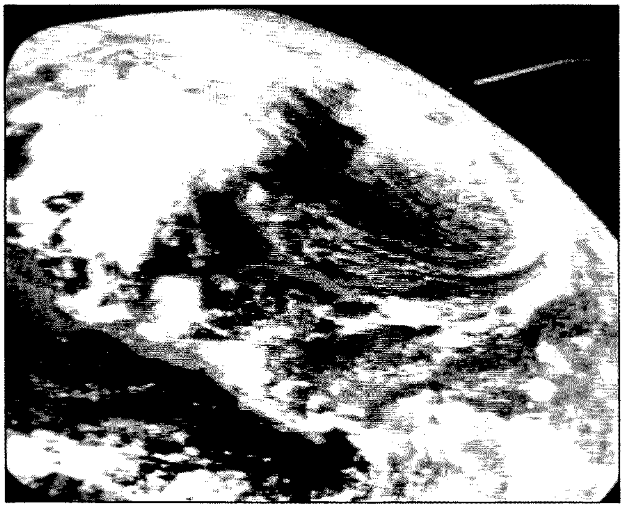

Photo A. A reasonably high quality shot using conventional B/W film. What looks like a UFO to the upper right is the only thing that mars this otherwise acceptable photo. This particular UFO is the fluorescent light fixture on the ceiling of my basement station!

easier to obtain accessory items such as cable releases and close-up lenses for these cameras, however, since most are fairly current. The use of color films always presents problems with color balance, a subject I will discuss below.

A final comment about Polaroid films in general. Compared to conventional B/W and color negative films, the "instant" films tend to have a noticeably narrower dynamic range. This means that they are more critical in terms of the proper exposure and also that they will have more trouble reproducing the full range from black to white on CRT or TV monitor displays.

You may find that you will have to reduce your brightness and/or contrast in order to avoid saturation at the black and/or white end of your display system dynamic range. This is a fancy way of saying that a slightly washed-out display will probably yield a better photograph with these films!

Roll Film

The use of roll films has a great deal to recommend it compared with the "instant" options. The cost per print is usually quite a bit lower, the films have a wider exposure latitude, the cameras are more flexible, and you can prepare primary or duplicate copies at any size to suit your needs. The price you pay is delay in seeing the results—ranging from an hour or so to many days, depending upon your processing options.

By far the best roll camera option is a single lens reflex 35mm that will allow you to focus and compose the picture without margin for error. Most such cameras will focus down on a standard TV monitor with no fuss, and even if you have to get really close, that can be accomplished with inexpensive lens extension tubes.

If you don't already own such a camera, a 1970s vintage Pentax™ or other model can be picked up at used camera shops for a real bargain since most serious photographers are trading up to today's "intelligent" cameras. The ability to determine exposure with a through-the-lens metering system is the only really special option you need, so there is no point getting one of the newer models unless you have some other uses for it.

Most such cameras will have only a B shutter position for long exposures, so you will need a locking cable release for photographing a CRT display. You should also use a relatively long (1/4- to 1-second) exposure when photographing a TV monitor display. This is due to the fact that such single lens reflex cameras employ a focal plane shutter that will create a mysterious diagonal line across your image if a shorter exposure is used.

You might also remember that a complete fast-scan frame takes between 1/60th (non-interlaced) and 1/30th (interlaced) of a second. If you shoot with a faster shutter speed, you will not have to worry about the shutter trace since you won't get an entire frame!

Although it should be obvious, the long exposures required for CRT monitor photography will require a fully darkened room to avoid washing out your image with ambient light. TV monitor photography doesn't require complete darkness—but the darker it is, the better will be your image contrast.

Also, keep a careful eye through the viewfinder for possible screen reflections from lights in the room! (See this month's picture for a graphic example.) You would think that these would be easily noticed, but they can be overlooked if you don't observe a darkened screen with some care!

I eventually avoided all of these problems by setting up a small monitor and a camera in a crude box with a remote shutter cable. My scan converter pumps out several hundred WEFAX pictures each day, and I never know which one might strike my fancy. With my little box, I simply reach out and snap any picture when the main station monitor suggests that it is interesting, and I don't have to pay attention to room lighting!

Film Processing

Processing your film can be your biggest headache. Without a doubt, doing the job yourself will yield the most consistent results and highest quality. Unless you are already into photography and home processing, you can expect to spend $150 to $200 to set up a very basic darkroom for 35mm black-and-white processing and printing. If you make this investment, you will give yourself complete control over the size and composition of your prints, not to mention their overall contrast and appearance.

Getting a good reproduction of what you see on the screen is not easy. Modern automatic processors with their computer controls are marvelous for the average snapshot, but are no match for what you can accomplish yourself when you know what you want! I had reached the point where I was beginning to think that I would never get any decent scan converter pictures until I broke down and reactivated my darkroom after many years.

"Don't let the photo store bamboozle you into lots of expensive equipment."

I use Kodak Plus-X™ film for all monochrome photography, as it combines fairly fine grain with good speed. Processing the film will require a 35mm film tank and the proper chemicals. I use Kodak Microdol X™ developer for all my film. I dilute the stock solution with two parts of water and process it for 12 minutes at room temperature. I skip a stop bath and simply rinse at the end of development since Microdol is a relatively slow developer. For fixing, I use Kodak Kodafix™ since it will do the job in about two minutes and has good storage characteristics.

Making prints will require an enlarger, chemicals, and paper. I process all enlargements in Kodak Dektol™ and fix with the same fixer I use for films, but diluted as per the instructions for prints. I use Kodak Kodabrome RC™ paper for all my prints since it also works out best for my photographic FAX recorder. Try to choose a resin-coated paper (that's what the RC means) since it will wash in a few minutes and can be dried on a paper towel after blotting.

Get yourself a good book on darkroom techniques, but don't let the photo store bamboozle you into lots of expensive equipment. Hardware store plastic trays work fine instead of expensive darkroom trays, and a cheap 7-1/2-Watt red nightlight bulb will replace a $40 darkroom safelight! My darkroom operations have always been low budget, and the only inferior photos I have ever used have been commercially processed!

Of course, not everyone will carry their satellite interests as far as setting up a darkroom. If you want only an occasional picture, it is more cost-effective to use commercial processing, but here you will run into a problem. These days, while one-hour processing of color prints is common and overnight processing is the rule, it can take you well over a week to get a roll of black-and-white film processed, and in most cases you are not likely to be thrilled by the results! The job is also likely to cost as much (if not more) than an equivalent roll of color prints!

The problem is that few people shoot B/W film these days, and even the larger photo-finishing establishments will set up for such film only every week or so. You can take your business to a custom finisher if one is available locally, but that will be expensive! One solution is to shoot your display with color film and take advantage of the fast turnaround. The problem you will encounter here is that of color balance, alluded to in the discussion of SX-70 films.

Shooting in color is rarely useful with CRT monitors since the phosphors used to get long persistence (P7 typically) will yield unpleasant colors with color film. Even shooting from a B/W monitor when using a scan converter will yield surprising results—with either print or slide film the image is likely to be in tones of blue! The films do not react to color the way the eye does, and virtually all of them will be far enough out of color balance to be annoying.

With a little luck and perseverance, you can correct the color to a large extent using a very light yellow filter (yellow will block blue while passing red and green), but it will be difficult to find a filter of just the right density to do a perfect correction job. You are in luck, however, for there is a new B/W film, which should become more widely available, that will solve the problem of both CRT and TV monitor photography. The film, type XP-1, is manufactured by Ilford, and the one I have tried is XP1 400, a 400 ASA, fine-grain film that is quite fast (equivalent to Kodak Tri-X).

The thing that makes this film unusual is that it is processed using *color* chemistry! Like color films, it uses dyes rather than silver and can be handled by most

processors with the same speed and convenience as conventional color print films. The print from the negatives can also be done in your own darkroom on standard B/W papers should you want copies or enlargements. My wife and kids think that a color black-and-white film is ridiculous and they are probably right! It does solve a problem, however, and you may wish to give it a try.

Alternatives

Although photography is one of the most popular ways to document pictures, there are other ways. In an earlier column I mentioned video printers. None of these is yet up to the standards of a good photograph, but they are convenient. You may wish to keep an eye on that technology for future developments. In the meantime, I am working on a project specifically for scan converters that will blow the socks off any video printer. If I get off my duff and finish it, I will make it the subject of a future *73* article!

Picture of the Month

This little item is a reasonably high quality shot using conventional B/W film of a NE quad from GOES E as displayed on the *WSH* scan converter with 256 x 256 resolution and 16 grayscale steps. There is a major storm system covering the eastern U.S. which we in Michigan considered normal winter weather but which the folks on the East Coast thought was the end of the world! Guess it all depends what you are used to!

What mars this otherwise acceptable photo is what looks like a UFO track in space beyond the limb of the earth to the upper right. This particular UFO is the fluorescent light fixture on the ceiling of my basement station! Some days you just can't win! Now you can see why I use a dedicated monitor and camera in a box. Basically it saves me from being embarrassed by the obvious!

Note

References to the *WSH* refer to the third edition of the *Weather Satellite Handbook*, available from yours truly at the address at the beginning of this column for $12.50 plus $1 shipping and handling in the U.S. and $2 elsewhere. ■

LOOKING WEST

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INDECENT INNUENDO

Obscenity, even by innuendo, will no longer be accepted on any of the airwaves, including the amateur radio bands. This is the result of several FCC actions announced on April 16 and aimed directly at removing all offensive language from broadcast radio, broadcast television, and even personal radio communications.

In a major press conference that day, the FCC announced that it was expanding its definition of what it considered to be "obscene, indecent, or profane language" and issued what it termed a "new standard of decency" for broadcasters to follow. Under the new policy, television and radio stations will have to be far more careful of the content of the material they air to be sure it does not contain "indecent innuendo" of the type now popular on some drive-time radio programs. The commission stated that it is returning to its older generic definition of what consitutes indecency: "language or material that depicts or describes, in terms patently offensive as measured by contemporary community standards for the broadcast medium, sexual or excretory activities or organs."

Since a 1978 Supreme Court ruling in their favor, the FCC has used a far narrower interpretation of what it has the right to deem as obscene, based upon what are called "the seven dirty words that you are not supposed to say on the radio or TV." This standard came about as the result of New York City Pacifica Broadcasting station WBAI having aired a George Carlin comedy routine of the same name in the early 1970s and having been cited for doing so by the FCC. The matter wound up in the Supreme Court, with the government winning the case.

At their April 16 press conference, the commission also warned broadcasters that it is no longer safe for them to assume that no children are viewing their programming after 10 p.m., and now say that indecent material, of any type, is banned from being aired at any time when there is "reasonable risk" that there may be any children in the viewing audience! The FCC notes that a safe time period may exist, but that it definitely does vary from city to city and that broadcasters must adjust their programming schedules accordingly.

The FCC decision to expand its definition of obscenity appears to have come from a myriad of public complaints to the commission. In recent years, the FCC has been receiving in excess of 20,000 letters of complaint annually dealing with the broadcast of offensive material. While no broadcaster to date has violated the current rule, some have been attempting to circumvent it and advance their station ratings by using a programming format called "shock-talk," which at times uses indecent innuendo in its broadcast material.

While the FCC has not outlawed shock-talk, it has made it clear by several actions that indecent innuendo is not to be tolerated. The commission also voted to send warning letters to Infinity Broadcasting's WYSP-FM in Philadelphia, Pacifica Foundation KPFK-FM in Los Angeles, and student-run station KCSB-FM at the University of California in Santa Barbara, dealing with what the FCC views as various pieces of offensive material aired by the three.

"The FCC is applying the same obscenity standard to the private radio sector that it applies to the broadcast industry."

So what does all this have to do with ham radio? The commission is also applying the same standard in the private radio sector. On April 12, it took an action that may eventually impact on every private radio user including amateur radio, CB, land mobile, and perhaps even radio-relayed telephone. The commissioners decided to overturn a 1983 review board action that had reinstated the revoked amateur license of David Hilderbrand N6BHU of Hollywood, California.

Hilderbrand's license had been ordered revoked after an FCC administrative law judge had ruled that N6BHU had violated the FCC prohibitions on the use of indecent language over the air as outlined in 97.119. The finding involved transmissions alleged to have been made by Hilderbrand over a Los Angeles 2-meter repeater. It was based upon the same anti-obscenity guidelines that were being used to judge broadcast cases (Pacifica vs. FCC). However, the review board reinstated Hilderbrand's ham ticket after it ruled that regulations governing indecent language in the broadcast industry were not applicable to two-way personal radio.

The FCC's Private Radio Bureau did appeal the findings to the full commission, but the review board action had angered many in the ham community, including former U.S. Senator Barry M. Goldwater K7UGA. Also quite upset were the top-brass of the ARRL.

Goldwater made known his feelings almost immediately. He called members of the FCC before his Senate communications subcommittee and questioned them on what they specifically intended to do in regard to this review board decision. Goldwater reportedly made it clear to former FCC Chairman Mark Fowler that the decision was not in the best interest of the U.S. amateur service. Goldwater never mentioned Hilderbrand by name, but at that time only one such decision involving amateur radio had been handed down, the one involving David Hilderbrand N6BHU.

On March 3, 1983, the ARRL entered into the Hilderbrand case. It filed a 15-page "Motion of Intervenor" before the commission. The ARRL was not as concerned with getting a final revocation of N6BHU's license as it was with clarifying that both the findings in the Pacifica Broadcasting Case (explained earlier as the seven dirty words) under 18 U.S.C. 1464 and FCC regulation 97.119 (which deals with transmitting indecent language on the ham bands) were in agreement and constitutionally correct. The League based its motion on the premise that "an intolerable and unlawful precedent had been set by the review board." And, that's where the matter stood for over four years.

Then, on Thursday, April 16, 1987, the Associated Press reported that the FCC was also reasserting its authority to regulate indecent broadcasts in the private sector and noted that the commission was "warning amateur broadcaster David Hilderbrand of Hollywood, California, about repeated use of offensive language on the air." Subsequent information supplied by ARRL and FCC sources said that the commissioners acted on April 12 to reverse the 1983 review board finding that had reinstated Hilderbrand's amateur license. In doing so, the commission noted that the interpretation taken in 1983 by the review board was incorrect. That is, that standards applied in broadcasting were also applicable to private two-way radio conversations over the air, including amateur radio.

Hilderbrand's license was not pulled, but this now becomes a landmark decision in private radio because it both gives the FCC power to remove any violator of Rule 97.119 from the air and it sets definite standards that must be observed by all sectors of the public when knowingly or even unknowingly using two-way radio as a part of a communication. As an example, if the commission decides to apply and/or enforce the new interpretation across the board, users of profanity on CB or possibly on cellular telephones could conceivably face a penalty. Just how far the FCC intends to go in its enforcement of the new and broader anti-obscenity regulatory interpretation is unknown.

For his part, back in 1983 Hilderbrand maintained the correctness of the review board decision that reinstated his license. At that time, he told *Westlink Report* that if the commissioners were ever to rule against him that he was prepared to take the matter into the federal court system, and even to the Supreme Court if necessary. It took almost four and a half years for the commissioners to decide that their review board decision was incorrect, and they have held Hilderbrand responsible for his earlier actions.

But, there's another twist. While the commissioners reversed the review board's 1983 decision that reinstated Hilderbrand's license, they have no plans to revoke it or to impose any

other penalty on N6BHU. Given as a reason is that there may be a legal question dealing with the statute of limitations in proceeding with a penalty imposition, as to whether or not license revocation might be too harsh a penalty at this late date in the case.

In essence, the Associated Press story noted previously is correct, and the commission in this case is merely symbolic. It's a warning to others not to be caught using what the FCC views as profanity or obscenity on the public airwaves, even in a private conversation. You risk your license and more if you do.

Only In California?

I know you may find this next story hard to believe, but as you read it I suggest that you think "southern California." Think about some of the well-documented stories of the not-so-distant past—tales of the jamming of amateur repeaters, simplex channels, and even high-frequency DX. Malicious interference that always seems to get traced to a ham somewhere in the southern tier of California. The list of ex-hams found guilty of this offense grows longer every year, and by now you would think that everyone who has any access to a ham rig would know that the days of even "fun jamming"—if there is such an activity—are over. Since the early 1980s, it's been "get caught jamming and your ticket goes away." But every couple of months a story breaks that seems to link a licensed amateur radio operator to this kind of illegal activity.

And so it was that on Sunday, April 12, I stepped off an Eastern Boeing 727-200 jet to find out that another "bust" had taken place while I was away videotaping a ham convention in Kansas City. This time it wasn't a ham jamming another ham. Nor was it your usual "ham jams net" incident. No, this time it was a ham that the government says has taken on the FBI. Here's the story as it stands in late April.

"If it's possible to catch an alleged jammer of the FBI's radio system in 10 days, why does it usually take years to get the FCC to clean the rats from our radio systems and our bands?"

A San Diego, California, ham is at the moment free on $150,000 bail following his arrest for allegedly jamming the two-way radio system of that city's FBI office. Extra-class licensee Jerry Edward Gastil K6DYD was arrested in his vehicle at about 6:15 p.m. by FBI agents on Friday, April 10. His arrest culminated a week-long investigation and surveillance by FBI agents and FCC engineers. According to FBI Special Agent James Bolenbach, the interference started on April 1 and continued each weekday through April 10.

The interference took the form of music and other sounds. Bolenbach told *Westlink Report* writer Mike Sullivan WA6HJJ, "The interference would start up at the most inopportune time. Just when we had heavy traffic or a bank robbery situation or something where we need it [the radio system], here would come this powerful signal, enough to drown out and prevent our cars from communicating with each other or with headquarters."

Gastil is charged with a two-count complaint filed in U.S. District Court. One count alleges his interfering with a government communications system, which is a felony carrying a possible maximum penalty of up to 10 years imprisonment and/or a $250,000 fine. A second complaint is a misdemeanor charge of operating on a radio frequency without a license. In addition, Gastil's vehicle and the radio equipment inside it were seized at the time of his arrest and could ultimately be forfeited to the government.

According to a report in the *San Diego Union* newspaper, the FBI filed an affidavit with the complaint in which the agency asserted "that Gastil caused music and other sounds to be transmitted on the FBI frequency, interfering with regular FBI transmissions." The affidavit continues by saying that the signals allegedly produced by Gastil were monitored by an FBI electronics technician and those of the FCC. An analysis by the FCC indicated the transmissions were of a type that would originate from a mobile unit, and that the ability to transmit the interference would involve considerable knowledge of radio communications. Gastil is employed as a radio electronics technician by an Escondido firm, as well as being a licensed Extra-class ham.

The FBI says that on Wednesday, April 8, Gastil was observed as he drove to the top of a hill in San Diego. In the same surveillance, a radio direction finder was used. As Gastil drove down the hill, interfering transmissions were received and the radio direction finder operator found that the signals were being transmitted in a manner consistent with the movements of Gastil's vehicle.

Thus far, authorities say they have no motive for Gastil's alleged actions. He was scheduled for a preliminary hearing in federal court on April 24.

And that leaves this reporter with a big question. If it's possible to catch an alleged jammer of the FBI's radio system in 10 days, why does it usually take years to get the FCC off its duff to clean the rats from our radio systems and our bands? I guess the fact that we pay the salaries of all federal employees through our taxes has little meaning anymore. Obviously, we hams just don't count. A rather sobering item to dwell on from those of us who write the late shift in the City of Angels. ■

QRP

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Photo A. The Heathkit HW-8 (top) and the HW-9 (bottom) QRP transceivers.

NOVICES AND QRP

Let's dig down into the mailbag this month. I have to get some loose ends tied up and while I'm at it, unravel some at the same time.

One of the most asked questions in the last few months was: "What about us Novices?" Second place went to: "How about a look at what is out there for us in the way of equipment." I'll try to do my best on both questions.

Good grief, do I ever remember my Novice days. Scared stiff just to make a CW contact with someone in another state was bad enough. To try and QSO someone running less power than a CB, you'd have to be crazy. Well, as the song goes, "Still crazy after all these years."

Operation

Having one oar out of the water sure helps when you're running low power in the Novice bands. First things first. As a Novice, get in your log a good number of contacts. How many is a good number? Well, you should be over your key fright, be able to send CW reasonably well, and have a good relaxed feeling in front of the radio. When you can truthfully do all the above, you're ready to try QRP. Perhaps that may sound a bit rash, and I guess It is, but you have to get your basic operating techniques down before you try something different.

QRP operation can be found in the Novice bands at or on the following frequencies: 3.710, 7.110, 21.100, and 28.110 MHz. I have found that operating on 40 meters during the daylight hours will produce a contact easier than most other times.

Don't jump right into low-power operation within the Novice bands. Get your feet wet first. If you're running a commercial radio, reduce the power to 75% of full output. Keep the drive at that level for a month or two. Reduce drive again to 50%. Run the power output at this level only for two weeks. Again, reduce power to only 20%, or about 20 Watts of rf output. Leave the power at that level for one month. After that time is up, take a deep breath and turn the drive control down so no more than 5 Watts output appears on the wattmeter. (Now would be a good time to build that swr meter from a few issues ago.) Congratulations, you've entered the world of QRP.

From an operating point of view, 40 meters will only be good for Novice use during the daylight and early night times. The foreign broadcast stations will eat you alive on that band. After dark, switch over to 80 meters. When the sunspots get their act together, 15 and 10 meters should show promise during the day and evening hours.

Calling CQ will now prove to be much less successful than at the 100-Watt level. When the bands are quiet, CQs may turn up a contact, but don't bet a lot of money on that happening. The technique of "tail-ending" may help the Novice. While tuning the band, listen for two stations that are in QSO. When the stations sign with each other, call the loudest one. The operator on the other end will probably still be listening on frequency and will hear you call him.

Try to run the radio selectivity at the widest position that is available. The reason for this is to allow you to hear other stations that may be off frequency, yet are calling you. After contact has been made, close up the selectivity.

After a few weeks of working QRP in the Novice bands, you can pass the General code test with flying colors. In fact, you could very well do just great in a QRM-coping contest as well.

I sure hope this information is helpful. Quite a few hams got their start by running low power. The gear is less expensive in many cases.

"With all fairness toward Heath, the HW-7 had a receiver that sucked canal water."

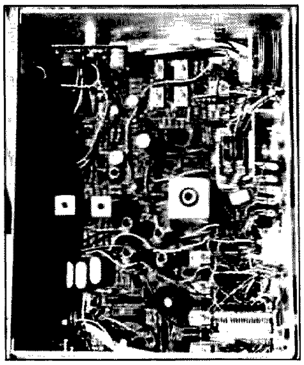

Photo B. Inside the HW-8. It has one board and is a builder's delight. I lied a bit, there is a smaller audio board mounted on the top left.

Equipment

Running low power does not mean running inferior equipment. Like many other hams, I build a lot of my own gear. I do, however, like the commercial equipment also. Let's take a look at what is available for the QRP operator.

I'll first look at the Heathkit series of low-power radios: the HW-7, HW-8, and HW-9. If you're into QRP, at some time you'll operate one of these radios. The first model introduced was the HW-7. Between the years 1972 and 1975, it sold about 10,000 units. With all fairness toward Heath, the HW-7 had a receiver that sucked canal water. Many a modification was printed to fix what Heath did not. Some of the modifications were only slight circuit changes. Others used a completely new receiver front end.

Aside from the receiver troubles, the HW-7 worked quite well. It had a power output of about 2–3 Watts. You could use crystal control for the transmitter as well as the built-in vfo. The receiver used the direct-conversion scheme.

The HW-7, unmodified, will not hold its own on today's bands. If you want one for your QRP collection, that's fine. Plan to pay between 30–80 bucks. That upper end would be for a perfect condition HW-7. Supply and demand will raise or lower the price.

The HW-8 was introduced in 1975. Heath fixed the receiver bugs that were in the HW-7. However, the cries of the QRP operators fell on deaf ears; they again used a direct-conversion receiver, although it was a great improvement over the HW-7's receiver. Power was boosted a bit to 3–4 Watts output. The radio covered the 80–15 meters.

Heath sold over 15,000 units before dropping the line in late 1984. The HW-8 has become the "Chevy" of low-power operation. The radios are still in demand on the used market. Plan to pay $60–$100 for a used one, depending on condition and accessories.

The HW-8 is going to be a tough

act to follow. But Heath Company is attempting just that with the HW-9, the third generation of Heath's QRP CW-only transceivers. I'm asked time and time again, "Which one is the best, the HW-8 or the HW-9?" Both have their place and their troubles.

The HW-9 comes in kit form. It is not an easy kit to put together. There are a lot of circuits that fit in a very small box. If you are new to kit building, get your feet wet with something else a bit easier to assemble. Then move on to the HW-9.

The HW-9 is essentially a stripped-down version of Heath's Model 5400 transceiver, incorporating some of the 5400's best features, minus the high-power module. The HW-9 is shoehorned into the same size case as the HW-8. The color has been changed from the classic Heath green to the darker color of brown which Heath now sports on their equipment. The innards feature two PCBs instead of one, as in the HW-8. Broadband tuning of the receiver and transmitter has done away with the preselector and push-buttons of the HW-8.

FINALLY, Heath listened. The HW-9 has a single-conversion receiver with a 9-MHz i-f and a four-pole crystal filter. Read that over again. The HW-9 has a superhet receiver instead of the often-cursed direct-conversion receiver. Top things off with RIT, a better audio filter, 5 Watts output (3 on 10 meters), and full QSK (break-in keying).

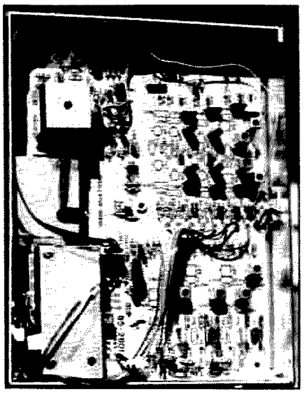

Photo C. Inside the HW-9. Notice how much more complex the inside of the HW-9 is. This is the top view.

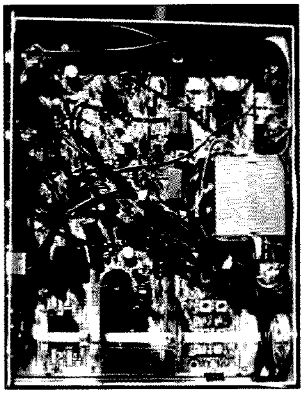

Photo D. Bottom view of the HW-9.

The basic radio comes with 80, 40, 20, and 15 meters. You can add 30, 17, 12, and 10 meters with an optional band package. All the bands are front-panel-switched. The HW-9, like the others, is a CW-only radio. The HW-9, with its superhet receiver, tunes upper sideband. You can't listen to SSB on 75 or 40 meters. You are on the wrong sideband for those bands.

You can, however, listen to phone on 20 through 10 meters. Heath sells the HW-9 for $250, but I have seen the radio on sale from Heath from time to time for as little as $199. That price is for the basic unit; add some more green for the band kit and optional power supply.

I have no idea how well the HW-9 is selling. It does seem to fill the void of a plain vanilla CW-only low-powered radio. Only time will tell if the HW-9 can fill the footsteps left by its little brother, the HW-8.

While the HW-9 is a radio for the QRP gang, Heath introduced the HW-99, which is geared toward the Novice. Band coverage is 80, 40, 15, and 10 meters. The HW-99 is an HW-9 with a power amplifier and 110-volt supply all in one box (more or less). The final transistors operate on 28 volts; therefore, the unit will not work off batteries. You can't add the WARC bands to the radio. For a deeper look at the HW-99, check out the April issue of *73*.

That's about it for this month. Next time I'll look at Ten-Tec and their line of QRP radios. Coming soon: solar/wind power, antennas, station accessories, and a whole lot more.

Send your photos to me along with your comments. Drop a line or two or three to *73* headquarters. Tell them how much you like the QRP column. From my mail bag, it's a well-read column. Thanks for all your support. ■

73 INTERNATIONAL

NOTES FROM FN42

A sense of humor can be handy. We keep noticing the increasing visibility of Japanese influences all around us, but not many know that if we are planning on a trip abroad from the United States we won't get there without help from Japan. Huh, you ask? Well, you see, the State Department's new million-dollar passport-producing machine (4200 per hour) was made in Japan by the Uno Seisakusho Co., Ltd., which came out ahead of everyone else in the bidding. So, yoi goryoko o! (Have a nice trip!)

Six Independence Days in July (in addition to our own, on the 4th.) Venezuela's is on the 5th, Argentina the 9th, Bahamas the 10th, Colombia on the 20th, Liberia on the 26th, and Peru on the 28th. The 1st is Canada Day, the 4th is Philippine American Friendship Day. It is National Day in Malawi on the 6th, France's Bastille Day on the 14th, and there are two each National Holidays and Liberation Days: Iraq on the 17th and Belgium on the 21st, for the former, and Nicaragua and Poland for the second, on the 18th and 22nd, respectively.

ROUNDUP

Japan. Congratulations to Japan also for developing a personal computer using TRON - a system which will accommodate the several-thousand-character Japanese alphabet. Actually, there are three Japanese alphabets, *Hirgana*, *Katakana*, and *Kanji*. The first two (samples spread around this page) are phonetic but can be used for writing, the last is used for writing only, and is based on Chinese characters, of which there are more than 20,000—so many, in fact, that nobody really knows the total. A sample of these is shown below. (There also is *Romanji*, which more or less translates Japanese words into the Latin alphabet.)

To the left, are characters saying (literally) "Stand under trees, waiting for rabbits." This comes from the Chinese folk tale of the boy out hunting rabbits who saw one run smack into a tree. He grabbed it when still unconscious and then waited in vain under the tree for more rabbits to run into it. Work the moral out for yourself!

Great Britain. Congratulations to *Short Wave Magazine* for completing 50 years of service to the radio amateur, and best wishes for the next 50. Perhaps in the coming years, however, the editors will learn technical terms and how to spell. I mean, really! "Valve" for tube. Lisence, spelled license (or licence, or is it lisense?) Football is spelled soccer—or the other way around—or Rugby? Favor is favour, and oh, yes, they drive on the wrong side of the road.

Poland. First notice: The Ninth Symposium and Exhibition on Electromagnetic Compatibility will be held in Wroclaw, Poland, June 28-30, 1988. Papers are now being called for on any and all aspects of EM, in English or Russian; they are due July 15 this year. Details available from the editor of this column.

Argentina. The president of the Radio Club Boulogne, Marcelo F. Avila LU5EIC, is the QSL manager for L2D (contest) calls and AZ1ARU/15, which was the commemorative call for the IX plenary assembly of IARU Region II, May to October, 1986. Address: C.C. 39, 1609 Boulogne Sur Mer, Buenos Aires, Argentina.

Greece. Listen for SY1UA in mid-June, writes Associate Professor Lukas H. Margaritis SV1ABX, for "a worldwide announcement . . . by short wave SSB two-way communication." The message will be about the 150th anniversary of the University of Athens. A special award-QSL card will be sent to all stations making contact.

Brazil. Received just in time for this issue: hot news: *Cool it!* Annual Fire Prevention Week is June 29 to July 5, and ZZ8ADV (SSB) and ZZ8VMC (CW) will be active on bands 10 to 80m. QSL manager, PW8DP, PO Box 84, Porto Velho, RO-78900, Brazil. Thanks to Ron ZZ8ADV.

Finland. Radio Finland offers North America (except Connecticut) 1-800-221-9539 as a source of recorded information and a place for you to record comments. These will be mailed to Helsinki. Your voice will NOT be used in programs. Thanks to *Radio Sweden International* Bulletin 1931.

AUSTRALIA

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MORE VK8

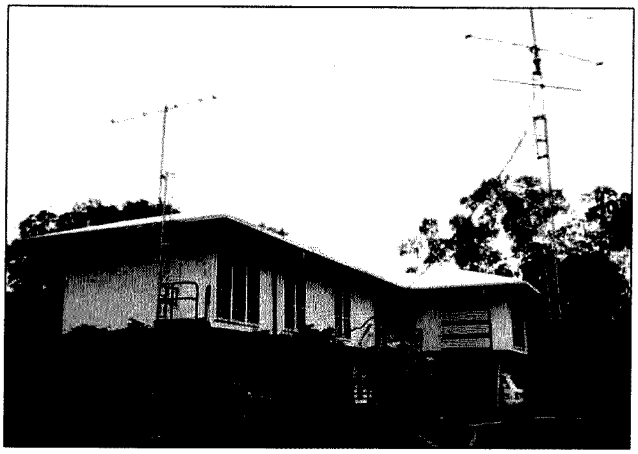
Why another article on VK8? The article in the May issue was about Alice Springs which is in the dry, red center; the other main city in this over-half-a-million-square-mile area is Darwin, a thousand miles to the north, with a tropical climate and different lifestyle.

Larry Munns VK8LM, the "Money Tart."

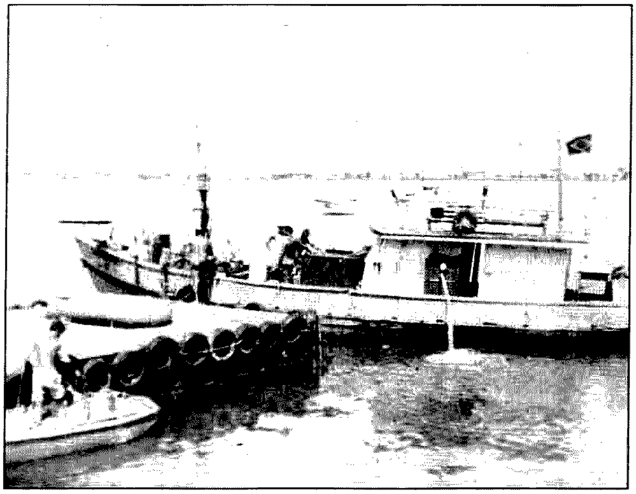
Crocodile Dundee Country. There have been seven people killed by crocodiles in the "Top End" over the last two years despite the signs all over the place saying No Swimming Due To Crocodiles! Two were taken by crocs last March, one in full view of a busload of American tourists. A cartoon in a local paper shows a crocodile reading a newspaper headline, "Croc Attacks Boost Tourism," and saying to a companion, *"Perhaps if we stop eating them, they'll go away."* It is a sad fact that in the last two years more people have been attacked or eaten by crocs in the northern parts of Australia than by sharks for the whole of Australia, in the last decade.

There are plans for a tourist hotel to be built in Kakadu National Park, where *Crocodile Dundee* was filmed. It will be in the shape of a crocodile, with the guests entering via the open jaws. (I wonder where the staff will have to enter?) *[For the last few months, Northern Queenslanders have been trying to solve the problem by eating the crocodiles, according to the Sydney* Morning Herald. *"They are munching their way through hundreds of crocodile steaks a week . . . one take-out outlet is selling crocodile burgers."—Ed.]*

Darwin's Pioneers. Without doubt, Darwin was our first multicultural society. Located closer to Asia than our other cities, in its earlier days it was the crossroads where East met West: Chinese gold miners, Japanese pearl fishermen, Malays, local aborigines, plus Europeans from many countries, blended together into a very mixed and at times violent society. Not so today. With a population of 65,000, Darwin is the capital of the Northern Territory (twice the size of Texas), and is a modern city with state-of-the-art complexes. Much of its up-to-date nature dates from Christmas of 1974 when Cyclone Tracy destroyed all



VK8LM's QTH. Left: 5-element 6m yagi; 8-element 2m yagi and 3-element triband TH3JK on right. Tower has been winched down for the wet (cyclone) season.



The "First Class" liner to the Rocks.

of the old character of Darwin, along with 95% of the city.

Crisis and Amateur Radio. Amateur radio played a major role during the aftermath of the disaster, with Slim VK8JY being the first to make contact with the Southern States. He made contact with Ken VK3AH in Melbourne. Slim spent 78 hours at the mike during this time, while Ken's home in Melbourne was declared an emergency station, with police keeping reporters and the public away. Messages by these stations were, at times, relayed by the Royal Australian Air Force at Butterworth, in Malaysia, to relief aircraft. This amateur radio involvement in the Darwin disaster is a story all in itself.

Fun and Games. Amateur radio is involved in most of the sometimes-weird activities up in the Top End. For many years Darwin held the title of the largest-in-the-world per-head-consumer of beer. With excess numbers of empty tinnies, the city decided to have a beer-can regatta in Darwin Harbor every year, with the requirement that all craft had to be made out of empty beer cans.

The Darwin amateurs provide communications for this event. They also provide communications for WICEN (Wireless Institute Civil Emergency Network), JOTA, and most contests, and engage in the usual fox hunts, etc.

With only 160 amateurs of various grades licensed to operate within VK8, only 71 have full call privileges to operate on HF. Not all of these are active, of course, so you have, on average, one HF amateur for every 10,000 square miles! This does make them a rare VK contact.

VK8DA. The first meeting and formation of the (then) Darwin Radio Club was held on November 7, 1966. In those days, there were not many resident amateurs. They chiefly were public servants from other states on three-year terms of duty. Some stayed on for longer periods, and others liked what they saw so much they are still in Darwin. They were a very enthusiastic and helpful group, and their energy led to the start of the club and VK8DA, the club station, and VK8VF, the 2m beacon.

Membership in the club seems to vary between 25 and 50. Their club station should be heard worldwide due to its diverse modes and transmission frequencies (see box). There is an affiliate group, the Territory Amateurs Radio Teleprinter Society, (TARTS)—VK8TTY; "tarts" is slang for girls of loose morals, but by no stretch of the imagination do members fit this description despite the titles of the officers. Bill "Spud" Murphy VK8ZWM is "Chief Tart," Henry Anderson VK8HA is "Miss Tart," and Larry Munns VK8LM is "Money Tart." The group rebroadcasts the ANARTS weekly broadcast with local editing each Sunday evening on 3.555 and 146.600 MHz, with call-back.

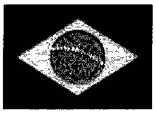
VK8DA—relays VK5WI Sunday morning broadcast on 3.555 MHz (also on 146.5 MHz, courtesy of Henry VK8HA)

Club Net—3.555 and 21.150 MHz Sunday at 1000 CST (0030 UTC)

Beacons—VK8VF on 52.200 and 144.480 MHz

Repeaters—(I) VK8RTE, Palmerston water tower, 147.000/146.400; (II) VK8RDA, Fannie Bay, 146.700/146.100

All repeaters and beacons built, maintained, and licensed by the Club.



BRAZIL

Carlos Vianne Carneiro PY1CC
Rua Afonso Pena 49, Apt.701
20270 Rio de Janeiro, RJ
Brazil

ST. PETER & ST. PAUL ROCKS

If you're not a crab, a sea bird, or a Marine, and you tell me you've been landed on St. Peter & St. Paul Rocks, two things will be clear to me: You are as mad as mad can be, and you must be a radioamateur—which means exactly the same thing.

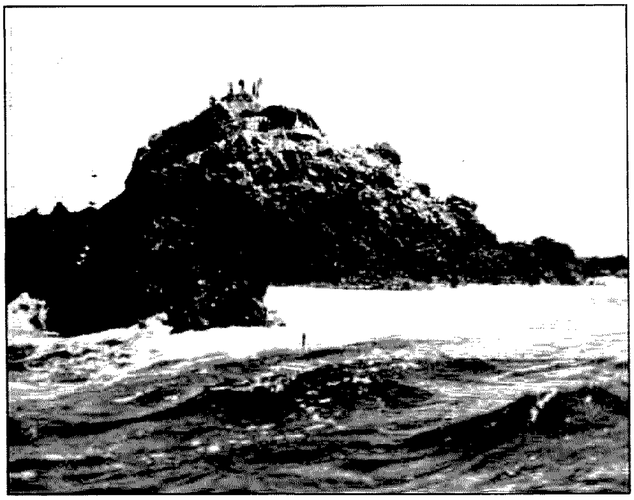
Ron PY1BVY and Paulo PY1ZT spent ten days operating from these "only-God-knows-what-for rocks," 640 miles out into the Atlantic from Recife, at 00° 56' North and 29° 21' West.

One year of planning and experience with the DXpeditions to Trindade Island (PY0T) and Fernando de Noronha Island (PY0F) brought Ron plenty of know-how, but nothing could prepare one for the tremendously inhospitable St.s Peter & Paul Rocks. They are a group of 7 or 8 savage volcanic upthrusts none higher than 20 meters (where Ron and Paulo set up), and the largest being about 75 meters long and 15 wide. No soil, no sand, not a drop of drinking water, just thousands of sharp volcanic edges making impossible even a single comfortable footstep.

Skipper Murrao.

Strong waves crashed against the rocks constantly, making landing an extremely difficult and unforgettable experience; a small rowboat is the only way to get inside the U-shaped stoney bay, trying to work in perfect synchronism with the 5-6-meter high waves. . . *Now! JUMP!* And one has only seconds to decide what to aim your feet at—if you really do intend to land on St. Peter & St. Paul!

There are plenty of crabs on the lower rocks, and two kinds of sea



The "home on the rocks" from the boat.

Ron (left) and Paulo at "home."

birds, the mumbebos and the Little Widows, and they are the Rocks' only living presences—except for bird lice all over, so plenty of repellents should be in the luggage. The two kinds of birds don't seem to exactly love each other: They live in completely separate colonies in this less-than 1,200 square meter area.

The temperature is a constant 26° C, the wind is permanently blowing, the equatorial rains come hard and sudden and leave as suddenly, there is an ardent, burning sun which is extremely dangerous if not properly considered and respected. The expeditioners' not-so-heavy canvas was simply torn away in the first strong gusts, and only a very heavy one, courtesy of the "Skipper" (Manoel Murrao) was able to last out the ten-day operation.

This was volcanic rock, so tremors were expected, but Ron and Paulo were sure frightened when at 1710 GMT on March 24, there was a shaking like that of a car crossing a light bridge. The Skipper confirmed it as an earthquake the next day; the boat crew was used to it as they always fished around the rocks.

Daily bathing consisted of pouring salt water over head and body, dipping it from tidal pools with a leather hat. This was because around the rocks lived a fish like a piranha, two spans long by one high . . . any living bait dropped in the water was torn to pieces in seconds, and Ron had touched a just-caught one and was surprised by a sharp bite to a finger tip.

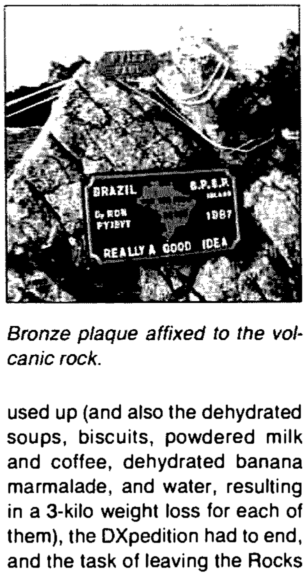
It took four and a half days to get to the Rocks in the 13.5 x 4 meter fishing boat, and it then was a day and two nights before weather conditions permitted landing. This involved getting 20 packages and the equipment ashore, including the 66-kilo Mongomery generator, which was hauled along cables fastened to the boat's mast and the rocks, with seven men pulling ropes!

The "home" on the Rocks.

The first day was spent setting up, raising two 10/80-meter verticals tied by ropes to the rocks (digging being impossible), and setting up the equipment on telescope-leg tables. And the next morning, after the 255-foot longwire was stretched from the main high point to another only 5 meters high, the Rocks went on the air . . . ZY0SA and ZY0SB . . . CO, CQ . . . .

The equipment was Yaesu FT-101E, FT-7B, FT-901DM, FC-901, 101B vfo, MFJ keyer, and the 1,450-Watt generator. Unfortunately, the vfo was damaged, and no split operation was possible; tremendous pileups on all bands could be only partially attended to. Total QSOs was 6,025 (see table).

There were plenty of QSY requests from Asia and Oceania, especially for 40–80 and 160 operations. The hardest pileup was at 40m, at times with six or seven QSOs per minute. On SSB, 83 countries were OSO'd, 81 in CW mode, and six continents each.



Bronze plaque affixed to the volcanic rock.

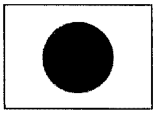
After the 171 liters of gas were used up (and also the dehydrated soups, biscuits, powdered milk and coffee, dehydrated banana marmalade, and water, resulting in a 3-kilo weight loss for each of them), the DXpedition had to end, and the task of leaving the Rocks began. After three hours of hard work all but the longwire had been recovered—and there was a sudden drastic weather change. Strong winds and high waves forced the boat away from shore, with Paulo and one member of the crew still on the Rocks. Time was so short that there were no choices—and the two waited for a high wave and dove in. All that anyone could think of during the terrifying, shocking, unforgettable time it

Band	Frequency	QSOs CW	QSOs SSB	Conditions
10	21.010/.020	92	21	Exc.
15		908	871	
20	14.015/.025	1,301	948	V. Good
40	7.002/.005	831	102	V. Good
80		354	46	
160	1.832/.834	528	23	QRN but FB
Totals		4,014	2,011	

took for the 25–30-meter swim was the voracious piranha-like fish!

Five days later, Ron and Paulo were back in Rio, readying the QSL card Ron designed and is sure that everyone will like. Lady luck had been on the side of the DXpeditioners—a little later the Skipper called to say that he'd tried to recover the longwire, but terrible weather and fantastic waves didn't allow him even to get close to the Rocks.

The QSL Manager is PY1BVY—PO Box 1502, Niteroi, RJ, Brazil 24000.

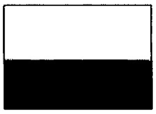


JAPAN

Japan Amateur Radio League
All Asia DX Contest
PO Box 377
Tokyo Central
Japan

The 28th All Asian DX Contest has been announced by JARL (Japan Amateur Radio League). Its purpose: to enhance the activity of radio amateurs in Asia and to establish as many contacts as possible between Asian and non-Asian stations. The contest periods are: Phone: 48 hours from 0000UTC the third Saturday in June (June 21) and CW: 48 hours from 0000UTC the fourth Saturday in August (August 22nd). Details from your radio club.

Last year, 697 stations participated of which only 38 were North American. W6RJ, NA5S, and K7SS were Continent leaders (single-op, single-band) on the 3.5, 14, and 28 MHz bands, respectively. The single-op, multiband winner: K3EST/6 for both North America and the world, and the multi-op, multiband winner: N6AW for North America. Other worldwide winners: UA9SP (3.5), UA9SHO (7), 4X8T (14), YC4FRX (21), DV1TV (28), and YEØX in the multi op, multiband category.



POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

The XVII meeting of the Polish DX Club, held last October in Mietno, near Garwolin, drew 150 members, candidates, and friends. Honored guests included Professor Dr. Eng. A. Zielinski SP5LVV, former president of PRAA, MSc. Eng. J. Rutkowski SP5JR, current president, A.K. Jeglinski SP5CM (one of the Nestors of the Polish hams), Region I, IARU officer, W. Nietyksza SP5FM, and Marcel Bargallo EA3NA. Dr. H. Cichon SP9ZD presided, and gave a report on the 60 years of DX Club activities.

The Club has 367 full members, 43 applicants, and 2,238 honorary members from 124 countries. The scores of the '86 SPDX Contest were announced (see box).

III CHAMPIONSHIP

The III Amateur's Radiolocation World Championship was held in Sarajevo, Yugoslavia, September 3–7. This event was held first under PRAA sponsorship in 1980, in Cetniewo, near Wladyslawowo; in 1984, the second was held in Oslo. (The next will be in 1988.) In 1986, 120 hams from 17 countries, including four from IARU Region III, competed.

The Polish women's team won 5th place, and individually, Sylvia Kurzawska was 7th on 144 MHz. K. Slomczynski SP5HS was chairman for the international jury which refereed.

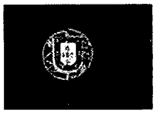
SPØDL/AM UNDER THE SKY

On Air Force Day, SPØDL worked for five hours from an airplane, using a Kenwood TS130, Yaesu FT290R, ICOM IC402, a 42m longwire, GP on 144 MHz, and a dipole on 432 MHz. The average flight altitude was 2,000 meters. With SP6ASD, SP6GWN, and SP3DFR operating, there were 400 QSOs on 20m, 350 on 2m and 0.7m, and a few experimentals on 20m and 10m. The first operation of this kind was on October 12, 1985, when the hams of Zielona Gora and SP3KJB/AM on board a four-seater aeroplane experimented with the effects on communications of engine and weather interferences.

Top Winners 1986 SPDX Contest

Individual stations:	SP3IBS, 231796 BY
Club stations:	SP2PDI, 250560 BY
1.8 MHz band:	SP5INQ, 3780 SE
3.5 MHz band:	SP3GEM, 38979 KL
7 MHz band:	SP9CTT, 10906 KA
14 MHz band:	SPNUT [?] 38820 KL
21 MHz band:	SP9CSO, 2204 BB
28 MHz band:	SP1OT, 9 SL
SWL:	SP-0237-WA, 49288

Right to left: CT4UE, CT4AT, our YL friend, Ines, N6TJ, CT1AOZ, and CT1BOH far in the back. (Photo by CT4NH)



PORTUGAL

Louis Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril 2765
Portugal

Been out of Portugal several months and didn't have a chance to do a column. A couple of things happened! Wayne Green is back, and I missed "Never Say Die" while I was away!

Don Riebhoff—1942–1987

It is so sad when we have bad news like this. Don Riebhoff is a Silent Key. Don was a telecommunications officer for the American Embassy, assigned to Lisbon in 1985. He died in an automobile accident in Spain last January, on his way back to his post.

Who doesn't remember Don and his activities? By which I mean his DXpeditions and trips, trips to XU1DX, 1S1A, C31ME, G5BNL, ZB2DM, FMØFC, HS3DR, XV5AC (I worked him in 1973), HS4ABM, TI9CF, K7CBZ, CT4AT, and K7ZZ in the USA. We were in touch quite often—he lived seven miles from me on a 2500-acre farm (*quinta*, as we say) on a hill overlooking the Atlantic, 45 minutes from downtown Lisbon.

He had several antennas for low bands, like a two-element KLM for 80m, on an 80-foot crank-up tower, several Beverages for 160, and his big 4-element cubical quad was just ready to go up on a 100-foot tower. He signed CSØAT last year in the CQ WPX test.

Don was born in Detroit Lakes, Minnesota. He served in the US Army from 1964-66, working for Boeing for four years before and one year after his army service. He joined the foreign service in 1971, serving in Saigon, Phnom Penh, Lisbon, Antwerp, Prague and Baghdad. Memorial services were held in the US Embassy in Lisbon and at the State Department in Washington.

60 YEARS FOR REP

The 60th Anniversary of Rede dos Emissores Portugueses is being celebrated by an award available to licensed hams and SWLs worldwide for confirmed two-way (or heard) contacts with Portuguese stations CT1, CU (ex-CT2), and CT3, between January 26 and December 31, 1987.

All VHF and HF amateur bands, SSB, CW, mixed, RTTY, FM, no cross-mode allowed. European stations, EA8, CT3, EA9—60 points; African and American stations—40 points; Asian and Oceanian stations—20 points. Portuguese stations may be contacted only once per band; the same station may be contacted on different bands.

Portuguese stations are worth one point each; the club station, CT1REP or CT6REP, count 5. No QSL cards, but send logs with date, time, callsign of station worked (heard), frequency, and mode. Provide your full name and QTH, and state clearly the endorsement for which you are applying. All applications must be countersigned by your national, IARU-member, society, to the effect that the QSL cards of the contacts are in the possession of the applicant and that the data are correctly listed. The separate awards are for each mode.

Awards are free to IARU-member club stations; others send 8 IRCs or US$4.00; address: Diploma 60th Anniversary of REP, PO Box 2483, 1112 Lisboa Codex, Portugal. Applications must be received on or before December 31, 1987.

That's it for now; a big Abraco for all of you, and see you next time. 73.■

PROPAGATION

Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA						20	20					
ARGENTINA	20	20	20	40			20	20	15	15	15	15
AUSTRALIA		20	20	20	40	40	20					
CANAL ZONE	15	40	40	40	40[1]	40		15	15	15	10	10
ENGLAND			40[1]	40			20	20	20	20	20	20
HAWAII			20		40		20					
INDIA												
JAPAN						20	20					
MEXICO	15	40	40	40	40[1]	40		15	15	15	10	10
PHILIPPINES							20					
PUERTO RICO	15	40	40	40	40[1]	40		15	15	15	10	10
SOUTH AFRICA			40	40		20	20				20	
U.S.S.R.							20	20		20		
WEST COAST	20	40	40	40[1]	40[1]	40						20

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA		20	20					20	20			
ARGENTINA	15	20	20	40			20	20		15	15	15
AUSTRALIA	15	20	20	20	40[1]	40		20			20	
CANAL ZONE	15	20	20	20	40[1]	40	20	20	15	15	15*	10
ENGLAND	20	40					20	20		20	20	20*
HAWAII	15	15	20	20	20	40	20	20				
INDIA												
JAPAN		20	20					20	20			
MEXICO	15	20	20	20	40[1]	40	20	20	15	15	15*	10
PHILIPPINES		20	20				20	20				
PUERTO RICO	15	20	20	20	40[1]	40	20	20	15	15	15*	10
SOUTH AFRICA							20				20	20
U.S.S.R.								20			20	

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA		20	20						20			
ARGENTINA	15	20	20	40	40			20	20		15	15
AUSTRALIA		20	20	20	20	40[1]	40[1]		20		15	15
CANAL ZONE	15	15	20	20[1]	40[1]	40		20	20	15	15	15
ENGLAND	20							20	20			20
HAWAII	20	15	15	20	20	20[1]	40[1]	40	20		20	20
INDIA				20					20			
JAPAN		20	20						20			
MEXICO	15	15	20	20[1]	40[1]	40		20	20	15	15	15
PHILIPPINES				20					20			
PUERTO RICO	15	15	20	20[1]	40[1]	40		20	20	15	15	15
SOUTH AFRICA			40						20			
U.S.S.R.									20			
EAST COAST	20	40	40	40[1]	40[1]	40						20

Many DX opportunities will present themselves in July as the bands stay open longer, but high atmospheric noise levels and the possibility of many days with an unsettled to active magnetic field will limit the otherwise improving conditions. While solar flux is up and improving, magnetic-field upsets detract form the good news. I'd be on the lookout for excellent VHF opportunities on the days that the HF bands are the worst. Remember that named days/conditions could be off by a day or two.

JULY

SUN	MON	TUE	WED	THU	FRI	SAT
			1 G	2 F	3 F–P	4 P
5 P–F	6 F–G	7 F–P	8 P	9 P	10 P	11 P
12 F	13 F–G	14 G	15 G	16 G	17 G	18 G
19 G	20 G	21 G	22 G–F	23 F	24 F–G	25 G
26 G–F	27 F–P	28 P	29 P	30 P	31 P–F	

AUGUST 1987
Issue #323

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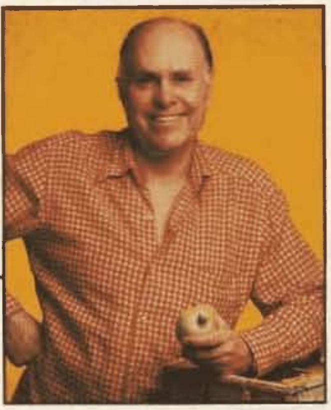
NEVER SAY DIE



I GET LETTERS

Chris N5IUF wrote in with a beef. It seems, according to Chris, that his good buddy Blaine AL7HH/5 managed to get a repeater channel assigned by the local coordinating committee. Blaine was fresh out of repeaters, so he "loaned" his channel to Dave N5DA and Jim NO5R. Dave and Jim already had one relatively unused repeater on 145.15, but apparently couldn't pass up the prestige of a second on 145.23. I think we'll all agree that two unused repeaters are always better than one.

Blaine and Chris, for some reason which Chris didn't explain—probably because there IS no logical explanation—decided to un-loan the channel. Dave and Jim, as anyone could predict, balked at being evicted, so everyone wrote to the FCC for help. On an intelligence scale from one to ten I'd put that move at around minus twenty-five. First, the FCC has virtually nuked their amateur radio staff. Secondly, we're supposed to be self-policing. Thirdly, why should the FCC (or anyone else) give a fiddler's fluke about a tempest in a teapot in Texas?

Hmmm. Dave and Jim are listed as Extra class in the *Callbook*. Oh-oh. This means, unless they went the Dick Bash way to get their ticket, which eliminated any need to even learn the code at all, that certain key sections of their brains may have been permanently damaged by the code, which often leads to totally unpredictable behavior. Perhaps we can get the *Callbook* to list Bash-Extras separately for us. I'm getting more information on the Novice group in Seattle who are taking up a collection to fund research on Morse code brain repair for Extras.

Someone at Dayton handed me a sample "Asshole Certificate." Oddly enough, it wasn't made out to me! In view of this brouhaha—plus the endless repeater stupidity in Southern California—perhaps it's getting time to start issuing numbered ACs. What do you think?

In this case I'd probably issue number one to Dave and Jim for thinking it's important to have two repeaters on the air. Number two would go to Chris and Blaine for thinking all of this is of any significance when compared with the federal deficit, the trade deficit, acid rain, baby seals, whales, Chernobyl, hunger in Africa, civil war in the Philippines, the loss of our consumer electronic industries, the drug problem, unwed teenage mothers, etc. Number three might go to the Texas FM Society for having rules which make such nonsense almost inevitable.

I gather that the coordinators give an available channel to the group which asks first—with the result that there is a long waiting list. Since the general tendency is for one-ham, one-repeater, I suspect the list could be monumental.

Might I semi-respectfully suggest the FM Society get their act together and rewrite the rules? How about setting up a panel of the presidents of the member repeater groups being coordinated. Any requests for a new channel or any controversies over a channel would be brought before the panel, with the litigants presenting their cases and the panel deciding.

Since all the available channels were assigned long ago, perhaps it's almost time to approach the situation practically and set up a study of the actual use of the channels. A group should have to show actual use of their channel in order to hold it—seems to me. I've visited the DFW area enough to know the actual use is around 0.03% or so. I've gone from channel to channel, calling plaintively for anyone to please talk to me. Silence. I've occasionally managed to stumble on some channels with someone there—and had nice contacts—but most seem completely deserted. Ghost repeaters?

Continued on page 10

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte 202 N., Peterborough NH 03458. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

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Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. A premium will be paid for accepted articles that have been submitted electronically (CompuServe ppn 70310,775 or MCI Mail "WGEPUB") or on disk as an IBM-compatible ASCII file. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request. US citizens must include their social security number with submitted manuscripts.

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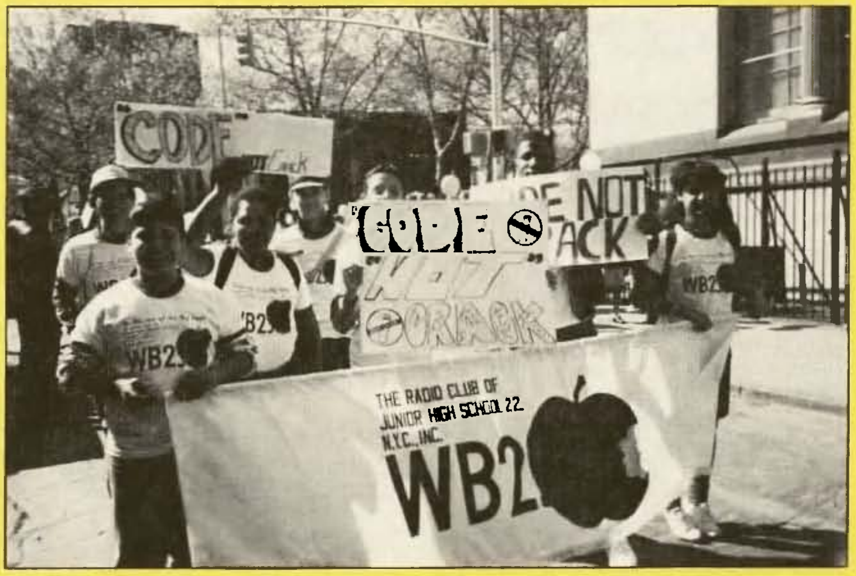
Code, not Crack!

OVER 200 MEMBERS of the **Radio Club of Junior High School 22** participated in a "Get High on Life" parade in the lower East Side of Manhattan on June 1st, to show just how they go about getting their high. Chanting "code, not crack" and praising "RST" over LSD, the crew was joined by several thousand other marchers representing civic and religious groups, all determined to rid the neighborhood of the drug menace.

The "crew at 22" uses ham radio daily to aid their education. The students are learning CSL (Code as a Second Language), and operate the daily Classroom net on 7.238 MHz at 1100 UTC, where they make an average of several hundred contacts a week. Through amateur radio, these students have a chance to learn about the world; the possibilities away from the lower East Side.

The Radio Club at JHS 22 is funded and assisted by the "Education through Communication" program, which is also involved in implementing the program in other schools around the country. This program is endorsed by such notables as President Reagan and Mayor Ed Koch, and by thousands of hams worldwide.

The parade was a huge success, and will likely become a regular springtime event on the lower East Side. The "Crew at 22" is proud to be a part of the effort to say NO to drugs, and to get their high with a mike or key, some wire and a rig. They know their friends are waiting.



The "Crew at 22" in the Get High on Life *parade in Manhattan.*

Mouth Mobile

SEVERAL YEARS AGO, there was an article in the medicine section of *Time* on the subject of medical detective work. One of the examples cited involved a man who went to a psychaitrist complaining that he was hearing radio broadcasts. Thinking to humor him, the psychiatrist asked what he was hearing right then. The man replied that he was hearing Rudy Vallee from the Steel Pier in Atlantic City. The psychiatrist turned on his radio and, sure enough, heard Rudy Vallee!

After much questioning, the psychiatrist discovered that the man worked in a glass bottle factory and had gotten some of the silica crystals in his dental cavities. The combination of the silica, saliva, and some bridgework in his mouth had literally transformed him into a walking crystal-radio receiver!

The psychiatrist referred the patient to a dentist, who filled the cavities and gave the man's teeth and bridgework a good cleaning. The patient "went off the air", was able to concentrate, and lived happily ever after.

Pan American Games

THE INDIANA SECTION OF THE ARRL will be assisting the **Tenth Pan American Games** in Indianapolis in August. Their two main functions will be to coordinate communications for operational activities associated with the games, and to handle traffic for the atheletes who will be coming from 38 of the Pan American countries.

Nearly 200 Amateur volunteers are needed to assist in the operational events, as well as for the Official Pan American Games Station (W9PAX), the Athletes' Village Station (W9JP), and the Traffic Outlet (WB9MPV). Anyone interested in voluteering their services should contact Cornelius Head WB9ZOE, 9046 Mercury Dr., Indianapolis IN 46229; (317)-263-5281 or (317)-898-2792.

Bicycling and Amateur Radio

OVER 60 VOLUNTEER HAM RADIO OPERATORS have been recruited to assist in the Transamerica Bicycle Race—an event which began on June 1st and will last approx. 5 1/2 weeks. Over 200 bike trekkers will bicycle from Seattle WA to Atlantic City NJ, to benefit the America Lung Association. The goal is to raise over $1 million to benefit programs in the ALA's three main areas of emphasis; smoking, as the major preventable cause of lung disease; occupational and environmental health; and the fight against specific lung disease. ICOM America, inc. has provided all the necessary communications equipment for the event.

Lazy VECs?

THE FCC HAS DECERTIFIED four more Volunteer Examination Coordinators. The latest to lose their right to coordinate amateur radio testing are: the Adirondack Amateur Radio Club VEC in New York, The Mark 4 VEC in North Carolina, the Dunedin VEC in Florida, and the director of MARS VEC located in Puerto Rico. According to the Commission, all of these VECs were decertified due either to their documented inactivity in testing, or their failure to provide the FCC with the required annual cost recoupment certification. To date, six of the original 27 VECs have been decertified, and *four* of the remaining 21 account for 85% of all ham exams given. These four VEC groups are: the ARRL, W5YI, Central Alabama, and Illinois-based De Vry Technical Institute ARC.

Hemisphere-wide Reciprocity Agreements

KOWALSKI WENT TO MEXICO CITY in May to conclude arrangements on the Inter-American Amateur Operation Convention. There has been much interest in setting up reciprocity agreements between North, Central, and South American countries ever since the Mexico City earthquake several years ago, where amateur emergency communications were hampered due to lack of reciprocity agree-

ments with Mexico. Kowalski states that "the final document on this issue will be forwarded to CITEL (the Spanish acronym for Inter-American Telecommunications Conference)—which meets every four years.

Sometime after August, this document should be open for signature by the administrations in this hemisphere."

Keen On Kemp

THE CENTRAL CONNECTICUT STATE UNIVERSITY Alumni Association has awarded Peter Kemp the Outstanding Teacher Award Citation for 1986-87. Besides distinguishing himself in teaching the Technical Arts at the Bethel Middle School, Peter established one of the country's first amateur radio societies, BEARS (Bethel Educational Amateur Radio Society). Many of Pete's students were involved in BEARS, and were part of the communications network during the 1986 Mexican earthquake, Hurricane Gloria, and numerous space shuttle missions.

Peter uses amateur radio to synthesize many subject matters such as geography, math, language arts, current events, and foreign language study. His program is the forerunner of many across the country and he and the program have been the recipient of national recognition.

73 congratulates Pete for making such a vital contribution to amateur radio where it counts most—in the educational system.

To All Mirage/KLM Antenna Users:

MIRAGE/KLM recognizes the numerous comments on the air and in club newsletters about the extremely high VSWR in the following antennas: 2M-11X, 2M-13LBA, 2M-16LBX, 220-14X, and 220-22LBX. They advise that these antennas are very sensitive and require that the attached leads to be as short as possible and balanced. As well, Mirage/KLM has devised a connector, supplied with all new antennas, that will remove any possibility of improper connections. Anyone with one of the above antennas may call Mirage/KLM at 800–538–2140 (outside CA) or 408–779–7363 collect (CA), to have a free connector sent to them.

Is That Country Banned or Not?

THE CRRL IS NO LONGER PUBLISHING the ITU's list of banned countries, due to too-frequent administration policy changes and because officials misinterpret questions on ITU questionnaires and submit incorrect information. No harm is done by trying to work a station from the banned countries list; if the station is truly forbidden to contact you, they will remain silent; if not, you may work a new country!

Just Add Water . . .

THE DAY MAY SOON BE NEAR when applicants who pass the exam will become "Instant Novices", with instant operating privileges. Ray Kowalski, who administers the Amateur Radio Service through his position as Special Services Division Chief, said that he has received so many requests for Instant Novice privileges, that the FCC put this out for preliminary comment as the first step toward proposed rulemaking. Ray also suggested that the call sign of the "Instant Novice" could be the call sign of the person who gave them the examination, plus a prefix.

Kowalski is very interested in finding out how the amateur community feels about this issue. Send your comments (original and five copies) to: FCC, Office of the Secretary, 1919 M St. NW, Washington DC 20554. *Be certain to refer to RM-5924.*

The End

This month's QRX has been compiled with the help of WB2JKJ, Mirage/KLM, *The CRRL News, The Westlink Report, The W5YI Report*, PCARS, and Leonid Yoffe with his teddy bear. Kuizma. Send your news and photos to *73* Magazine, WGE Center, Peterborough NH 03458, Attn:QRX.

DAYTON PICTURES '87

UP YOUR FREQUENCY
73 Amateur Radio

NEVER SAY DIE

from page 4

My suggestion to Chris was first to take up computers as a hobby. Second, I suggested he turn himself in to the mental health authorities as a case of advanced mind rot for even wanting a repeater. Third, I recommended he get the FM Society to change their rules. Fourth, I suggested he try to get Dave and Jim committed to a funny farm for being so out of touch with reality as to think all this is important. Fifth, I suggested Chris and Blaine move to 220 and set up a repeater there for Novices. Then, why not put in a link to the 145.23 input so the Novices could work crossband through any and all repeaters inputting there? How about a 145.83 to 145.15 linking repeater? One more link from 145.75 to 145.23 would lock up Dave and Jim's two repeaters. That's what's wrong nowadays—too little imagination. Of course there might be a problem getting the last two repeaters coordinated—unless there's someone like me on the coordinating commitee, in which case it'd go through in a flash.

I think I'll go ahead and bring out a nicely decorated Asshole Certificate. A chap on 20m yesterday sure earned one from me. This turkey got his kicks by calling CQ on top of any contact I tried to make—kept this up for about 20 minutes. Lucky for him I'm not an Extra, else I might have taken the first plane to Fredericksburg, Virginia, and done hamdom and his family a big favor. There are enough certificates needed so I suspect I could sell them in pads of a hundred. We'd sure do a land office business in Southern California and New York City.

Yes, I realize that the last thing any of the participants in a repeater hassle want are creative solutions—they're all looking for allies and a Big Win.

Getting back, for a moment, to the concept of use. Here we're really up against it. Once a coordinating committee lets it be known they're checking repeater pairs for use we'll see all sorts of subterfuges—like tape-recorded transmissions and endless IDs. Military shortwave stations often do this in order to prove frequency usage so they can hold their channels. Yet if any attempt is made to determine what actual intelligent use is made of repeaters, our whole house of cards will blow away. I understand there is a tape somewhere which was made of an intelligent conversation over a repeater—allegedly in Georgia—about five years ago. This is probably just another one of those ham myths.

You know. . .about those certificates. . .we don't want them used indiscriminately—that would lower their value. Suppose we set up a system where each one is numbered and signed by me. The fox guarding the hen house, so to speak (write). Applications for them would be sent to me, complete with an explanation as to why you think it's warranted. This would allow me to keep track of them and to report the awards. It would also tend to single out repeat offenders for our attention. I'd love to do some articles on legendary ham kooks such as W2OY and W2BIB.

As soon as I have a suitable certificate ready I'll let you know. What's a fair application fee? If we make it free we'll be up to here in applications. How about $5? That should about pay for the work here. We'll let the market decide. If we get too many at $5, we'll up it.

> ***"The last thing any of the participants in a repeater hassle want are creative solutions—they're all looking for allies and a Big Win."***

SMALL CHANGE

It's almost getting time for some new mode of ham communications, isn't it? We've been using sideband since around 1960, so it should be time for us to think up something new.

I think it was in the early 20s that we went from spark to CW, complete with the usual old-timer reaction of "Spark Forever." We didn't have very many hams at the time, but what few we had spent a good deal of their efforts fighting each other.

Before WWII, about 80% of all ham activity was CW—mostly on 40m, which was a CW band. Everyone was crystal-controlled, so it was normal procedure to call long CQs and then tune the whole band for a call. We had two phone bands of any great importance, 20m and 75m, both 100 kc wide (kHz hadn't yet been invented).

75m was occupied most of the time by nine groups of hams with kilowatts, each taking up 10 kc. These were very elite groups since a kilowatt of AM cost on the order of $50,000 in today's dollarettes. They ignored the plebeian 25-Watt hams. Persistent breakers would be acknowledged once to shut them up, but would never be given an opportunity to make a transmission.

20 meters wasn't much better. This was Class A territory—the land of Big Signals—and, being only 100 kc wide, there was room for about nine and then the band was full. Remember, everyone was crystal-controlled, so there wasn't any way to sneak into an unused spot in the band.

Class B hams—which most of us were—either ditted away on 40m, making contacts as exciting as those today—which means almost totally rubber-stamp contacts—or were adventurous and built a small 160m phone rig—a 6L6 oscillator, modulated by a 6L6, using an F1 mike swiped from a pay telephone.

Class Bers could use 10m, but that was a VHF experimental band—attractive to pioneers, but sneered at by real hams (Class Aers).

By the 50s, the vfo was in common use and war surplus rigs made it so anyone could whup together an AM kilowatt. The private-club phase of hamming was dying.

The expanding of 75m to 200 kc, the opening of 100 kc on 40m to phone, and the expanding of the 20m phone band were brought about by this general move from CW to phone in the 50s—complete with the usual infighting. I think it was W2EE who devoted the last years of his life to jamming 75m DXers trying to

Continued on page 53

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Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0889-5309) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

LETTERS

NOVICE DSB AM

Never before have amateurs gotten so much for so little than with the Novice Enhancement. These new privileges should significantly spur growth on 220 and 1290 MHz since several of the Japanese manufacturers presently have suitable rigs on the dealers' shelves.

Keeping in mind that the 2m FM boom resulted only because of cheap, plentiful, yet obsolete commercial FM radio gear, I think the League and the FCC should reconsider DSB AM on the 28-MHz Novice subband for several reasons.

First, as evidenced by the 10m FM boom, most CB sets readily convert to 10 meters. Their AM mode is obsolete compared to more efficient modes of modulation but the radios are surprisingly state-of-the-art. Novices would be no more handicapped running AM than we were running SSB or FM in the early days of these modes.

Second, many adults I know are hard-pressed to justify $300–$400 for a new FM rig. How many young teens can afford that much? How many more could afford $35 for a secondhand CB set and maybe $20 worth of parts to put it on 28 MHz?

Third, converting the set would give Novices an excellent opportunity for hands-on experience—SSB gear is formidable to work on, even for most higher-class licensees.

On the other hand, maybe the League and the FCC just want Novices to subsidize Japanese research and development, further widening their technological lead over us, and shrinking our technological manpower pool.

Richard Williams WB4FAX
Richmond VA

GLOBAL GOOD

When I look at what Amateur Radio is today compared to what it was in the past, the single word that jumps out at me is *relevance*. The essence of early radio was communication over great distances in what was basically a rural society.

Today's amateur radio seems to be more a vehicle for self-expression than a service in exchange for frequency allocation. It should be redirected more to service to the global community.

For example:

The Environment. Canada and the New England states are screaming about acid rain while Washington stonewalls the issue. Radio amateurs in the affected areas could set up a network of rain pH monitors and provide a continuous series of pH contour maps on a scale that no private organization or university could undertake.

Geophysics. As California awaits its next major earthquake, it's clear that there exists an opportunity for amateurs to experiment with laser- and microwave-based rangefinding equipment and help monitor and correlate geophysical data to aid in the prediction of earthquakes.

Developing Countries. Amateurs can make a significant contributions by helping to establish communications links and provide reliable sources of power.

This is the kind of relevant activity that would get me interested in amateur radio.

Ken Robart
North Vancouver BC

10/220 XLINK

Good news! The reception on 220 in this part of the country to Novice Enhancement has been very positive. There has been no great deluge of used gear hitting the market from dissatisfied upperclassmen nor any hazing of the Novices on 220. As a matter of fact, months before Novice Enhancement, there was great discussion on our local repeater, WA7SPR (224.10), as to how we could ease Novices into 220. We decided to provide a code-practice session on the repeater, and Frank WA7SPR provided a crossband link to the 10-meter Novice SSB subband through the 220 repeater, since not all Novices could justify spending a few hundred bucks to get on 220. Doing Novice code practice right in the middle of the Novice 10-meter SSB band attracted a lot of check-ins from both sides. We were able to discuss what was going on on SSB.

If you hear about any more hams throwing their 220 rigs in the can, let us know. We have a growing number of people here thinking about 220.

Bill Martin N7EU
Bothell WN

ICOM u2AT REVIEW

I was rather surprised to read the positive review of the ICOM micro 2AT in the May issue. I owned one of these units for a couple of days and was extraordinarily disappointed in its performance. Fortunately, the dealer from whom I purchased the unit took it back in exchange for another hand-held (the Yaesu FT-23R).

The biggest problem that it failed to mention the u2AT's most serious fault—that the radio won't scan in the usual sense of the word. That is, there is no way you can set the radio up to automatically step through each memory and stop when it comes to a frequency that is in use. Similarly, there is no way that you can have it scan the band or a portion of the band and have it stop when it comes to a busy frequency. Although advertised as "scan," that function only stepped through frequencies or memories when the button was depressed. This function, better termed "auto-repeat," makes the radio difficult to use, especially in the car.

The *73* review did, however, point out the other drawback of this radio—that it will not store repeater offsets independently in memory.

My only guess as to why these critical functions are missing from an otherwise state-of-the-art rig is that ICOM fears that a full-featured radio will cut into its market for the IC-02AT.

John Hansen WA0PTV
Fredonia NY

OOPS

You sure play fast and loose with figures. In coming up with the number of Soviet radio amateurs (Never Say Die, March, 1987) you must have rounded W5YI's 48,000 up to 50,000 and then dropped the last zero. How could there be 10 to 15 thousand active out of a total of 5,000?

Bob Eldridge VE7BS
Pemberton BC

Right you are. . . we dropped a digit.—Eds.

EMP UPDATE

Wayne Green's editorial remarks (April, 1987) seem to indicate some problem with official "secrecy" surrounding shielding and protection of sensitive solid-state amateur equipment against electromagnetic pulse (EMP) from nuclear blasts. Since this is an important issue for currently active amateurs and future generations, the following information may be helpful.

Technical data regarding relatively simple and attainable protective measures against EMP are available to anyone willing to purchase—or request through inter-library loans—the following publications:

1. Gladstone and Dolan, *The Effects of Nuclear Weapons*, Third Edition.
2. *Electromagnetic Pulse Protection Guidance* (CPG 2-17, January, 1986), available through your local State Civil Defense Office or the Federal Emergency Management Agency.
3. The NCS TIB 85-10 Document, issued by the Technology and Standards Section, National Communications System, Washington DC 20305.

There are other publications addressing this subject, but I think the above-mentioned will give sufficient technical information and guidance to those among us seriously interested in shielding and protecting our communications equipment against EMP from potential nuclear attack or emergency.

Dr. F. Paul Kosbab NF4E
Tulsa OK

WANT ONE?

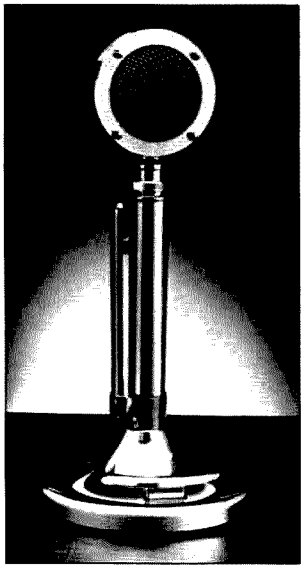
Since Novices and the Technicians are permitted to use a portion of the ten-meter band, why not sponsor a WANT certificate for working 50 Novices and 50 Technicians on the 10-meter band. It might even increase your subscription list if you offered a free subscription to the first Novice and first Technician to obtain requirements; I suggest no QSLs required.

I want a WANT. Do you want a WANT?

Buzz EggeBrecht W4BE
Port Richey FL

Anybody else out there want a WANT?—Eds.

NEW PRODUCTS



The new Silver Eagle.

MICROPHONE IMPROVED

The Astatic Corporation, manufacturer of the classic "D104" communications microphone, is introducing a new version of the Silver Eagle. The ETS9-D104SE± is the Silver Eagle plus a new microphone amplifier, switching system, and built-in end-of-transmission signal (ETS).

The ETS is a 1-kHz tone which is heard by both microphone operator and transmission receiver when the microphone is unkeyed. This tone indicates that the transmission is completed. It is generated electronically within the microphone and and is switch selectable.

Additional features include a new VOX switch for transceivers that incorporate this feature, a 20-dB pad on the audio output, and the capability of powering the microphone either from a 9-volt battery or directly from the radio.

For more on the Silver Eagle Plus microphone, circle Reader Service number 210.

TWO NEW ICOM BASE STATION TRANSCEIVERS

ICOM is introducing the IC-575A, a 10m and 6m dual-band base-station transceiver, and the IC-475A, a 440-MHz base station transceiver.

Both radios are all-mode, and have 99 tunable full-function memories, passband tuning, notch filter, noise blanker, built-in SWR bridge, semi or full CW break-in, and a multi-function meter. These transceivers also have velvet-smooth tuning knobs and easy-to-read amber LCD readouts with variable backlight.

Four scanning memories are available: band, programmable, mode and memory scan, with selectable lock-out. 99 memories can be scanned in five seconds. The IC-475A also has a tone squelch unit, speech synthesizer, an OSCAR module that allows tracking with a companion IC-275A or IC-275H, FL-83 500-Hz 10.7491-MHz CW filter and an AG-35 mast-mounted pre-amp.

The new IC-475A, a 440-MHz base station transceiver.

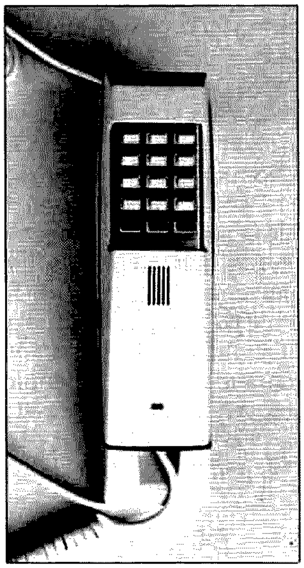
All subaudible tones are built-in and the actual subaudible frequency is displayed. Standard repeater splits are built-in and odd splits are programmable. A DDS (Direct Digital Synthesizer) is also included in the IC-575A for packet enthusiasts. The 10-Watt IC-575A and the 25-Watt IC-475A are similar in design to ICOM's compact base station line: the IC-735, the IC-275A, and the IC-275H.

The IC-475A will be available in May 1987. The suggested retail is $1,999. The IC-575A will be available in June 1987, and the price will be announced.

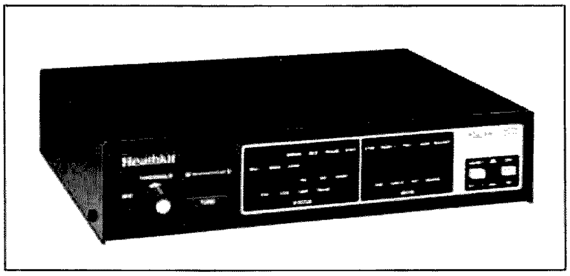
NCG HOTLINE-107 HAND SETS

The Hotline-107 Hand Sets was developed in response to requests from both Amateurs and Land Mobile Users.

The 107th featues include: a dynamic 100-Ohm speaker, and adjustable volume control, in-cradle dialing, vertical or horizontal mounting, and noise-cancelling microphone. Features in the 107M include the above, plus: auto-dial with a 10-number memory, a super-capacitor 14-day memory backup, a three-button memory



NCG's Hotline Hand Set.



HEATHKIT MULTI-MODE TNC

Heathkit is introducing their new HK-232 Pack-Kit™ Multi-mode Terminal Node Controller. The Pack-Kit TNC operates on RTTY, lets users run CW at speeds from 5 to 99 wpm and works on AMTOR, ASCII, HF (300 baud), and VHF (1200 or up to 9600 baud with an external modem) Packet. It is also capable of decoding weather facsimile onto an Epson-compatible printer.

Adding the HK-232 to a radio and a computer lets the amateur get on the air in every mode. It connects to the radio's PPT line, speaker output, and microphone input for interchangeable VHF and HF operation. The same connections work for all other modes including CW.

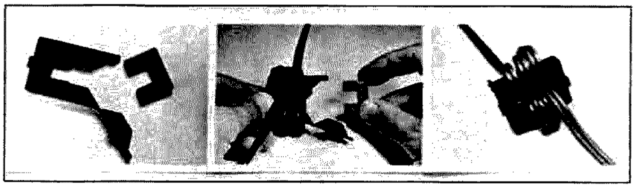
Amateurs can connect both their HF and VHF rigs at the same time, which allows switching between VHF Packet and copying a W1AW RTTY bulletin on 40 meters.

A "Signal" command causes the Pack-Kit to determine the correct RTTY, ASCII, or AMTOR mode for the signal that the amateur is listening to. It also presets baud rate and mode, and will invert the signal if necessary. The HK-232 even handles American Standard Baudot (Western Union), Japanese Katakana Morse, Cyrillic (Russian) Morse and translated versions of Katakana and Cyrillic.

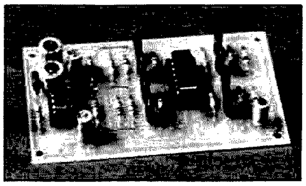
The HK-232 features an eight-pole audio by-pass filter, followed by a limiter discriminator with automatic threshhold correction.

No special software is required to operate the HK-232 Pack-Kit TNC. It can be used with any modem communications package you may already have or an optional program written specifically for the HK-232 and a Heathkit/Zenith PC or PC-compatible computer. It connects to a terminal or computer through a standard RS-232 serial port at baud rates from 300 to 9600.

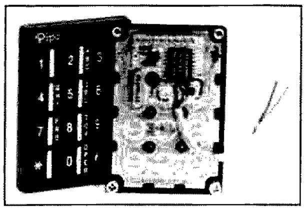
For more information on this TNC, please circle Reader Service number 201.



The MFJ-701 RFI-free Choke kit.



The CW-1 Active Audio Filter from BEL-TEK.



Pipo's P-7 touch-tone encoder.

set, and an ANI, installable by the system owner.

These nicely-styled Hand Sets are available through your local dealer or the NCG company. You can get more information on these sets by circling Reader Service number 204.

THE BANKER

Inventron Labs has introduced an exciting new accessory for owners of the Kenwood TS-940S transceiver. The Banker offers front-panel control of the radio's four memory banks, via the "voice" switch. The circuit board installs in the space intended for te voice synthesizer and simply plugs in. No modifications to the radio are necessary.

Pressing the voice switch permits the operator to select any of the four memeory banks, without using the radio's top-mounted bank switch. In fact, the switch need never be used again, so the sliding cover can remianed closed! The Banker cannot be installed if the voice synthesizer unit is already installed.

The Banker utilizes ultra-low-power circuitry, takes no power from the radio's back-up batteries, and is covered by a one-year limited warrenty.

The Banker may be ordered from Inventron Labs for $49.95. More information on this product can be obtained by circling Rader Service number 207.

RFI-FREE CHOKE KIT

MFJ Enterprises, Inc. is introducing its new MFJ-701 RFI-free Choke kit that eliminates RFI (radio frequency interference) problems that affect TVs, radios, stereos, telephones, VCRs, computers, PA systems, burglar and fire alarms, test equipment, modems, monitors, and other electronic devices.

A highly effective solution for eliminating RFI is to wind an offending cable or wire around a ferrite toroid to choke off RFI, but it difficult to find a toroid with the proper characteristics which has a large enough hole to allow passage of an end of a power cord, AC adapter, microphone cord, speaker leads, etc. The toroids in this kit, however, separate into halves, which makes it easy to wind around the toroids nearly any kind of wire or cable, even ribbon cable and coax. The toroid halves mount together in a snap-together plastic frame. The individual toroids can also snap together in a stack, to increase effectiveness for large-diameter wires.

For additional info on this choke kit, please circle Reader Service number 215.

COMMODORE 64/128 TERMINAL PROGRAM

Kantronics is announcing the release of their newest terminal program, the Kanterm 64/128, written for use with the Commodore 64 and 128 computer terminals. The program offers split-screen display, message buffers, disk storage, and type-ahead buffer. The C-128 runs in 128 mode and provides for 80-character lines. Kanterm can be used with most Kantronics "SMART" modems, such as the KPC-1, KPC-2, KPC-4, KPC-2400, KAM, and UTU-XT/(P). Kanterm 64 and 128 come together on one diskette. Suggested retail is $29.95.

For more information on this product, please circle Reader Service number 214.

NOVICE VOICE-CLASS "QUICK COURSE"

Gordon West Radio School offers a custom-developed Morse Code and theory course for the beginner amateur radio applicant. Two long-play srereo code cassettes cover learning of the code in a humorous and educational manner, and is designed for students with absolutely no background in code copy. In the fully illustated Novice voice-class license preparation manual, every Novice class question is covered by a thorough explanation and there is a discussion of the right and wrong answers that may be found on the test. The cassettes and book come with a white vinyl carrying case.

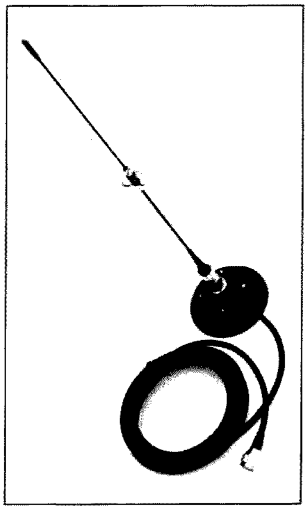
The "Quick Course" from Gordon West.

Also included in the packet are instructions to the two examiners, a thirty-question sample Novice exam, a five wpm sample code test, a 610 Form to use to apply for the license to the FCC, and a full-color ICOM frequency-band chart.

For more info on the Novice course, circle Reader Service number 208.

MINIATURIZED DTMF-ENCODERS

Pipo Communications has just developed a new line of Touch Tone Encoders, the P-7 and P-8 series. These encoders are the first of there kind in this industry and have steel keys and sealed gold dome contacts. They are miniaturized and designed to fit most radios. The dimensions of the P-7 12-Key encoder, vertical (P-7V) or horizontal (P-7H), are 2.16" x 1.5" x 0.20". The dimensions of the P-8 16-Key, vertical only (P-V8) are 2.16" x 1.9" x 0.20". This series is available in black or dark brown (to match the Standard Communications HX Series).



NCG's 900-MHz antenna.

These units are available immediately. For more information, please circle Reader Service number 206.

ACTIVE AUDIO FILTER FROM BEL-TEK

BEL-TEK introduces the CW-1 Active Audio Filter, which eliminates QRM and easily connects between the transceiver and speaker. The CW-1 has three selectable bandwidths of 90, 130, and 200 Hz with a center frequency of 200 Hz. It has a built-in audio amplifier to directly drive a loudspeaker. The kit comes complete with all the parts needed to make the CW-1 functional. The CW-1 measures 2" x 3.4" and can be powered by a 9-volt battery. Price: $19.95.

For more information, please circle Reader Service number 213.

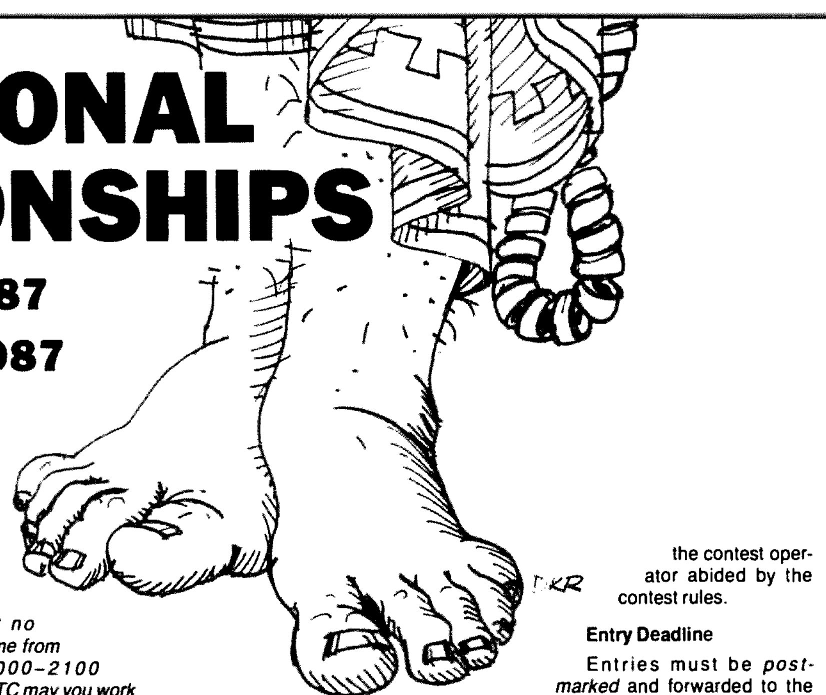
NCG 900-MHz ANTENNAS

The 900 MHz antennas are now available and specifically designed for use in the 902/928 MHz band. The mobile antenna uses a magnetic mount with a double coil whip. It is a 15-dB gain antenna capable of a maximum of 30 Watts of power. It is anodized black, and its model number is CMW-202N.

The 900-MHz base/repeater antenna is model number CFC7-71. It it is a collinear fiberglass antenna with a gain of 17.4 dB and maximum power capabilities of 50 Watts. Mast-mounting brackets and hardware included.

These antennas are now available through independent dealers and the NCG company. For more info on these antennas, please circle Reader Service number 205.

THE NATIONAL CHAMPIONSHIPS



CW: September 5, 1987
SSB: September 6, 1987

For the first time ever, the "Little Gun" has a chance to become a National Champion! The National Championships have been designed to recognize the Contest Operator of the Year. Unlike other events, they single out the best Contest Operator in the USA, not just the station with the biggest hardware investment!

There will be a *National Sideband Champion* and a *National CW Champion*. The combination of these two contest scores will determine the *Contest Operator of the Year*.

Contestants, analyze your band plan. *Do not* take these events for granted. They are, without doubt, the most complex stress-testing events on the bands today. If you understand the rules, you'll recognize "traps" strewn in your path. Being lax could spell your doom. Should you work all bands? How do you maintain your QSO rate without sacrificing your multiplier average? Should you be using the monobander? What happens when you switch to 10 or 160 meters for the 10-point QSOs? It's up to you, the *Operator*, to do what's best for you!

EXTERNAL AMPLIFIERS ARE PROHIBITED. Run barefoot (up to 200 Watts maximum exciter output power) or your entry is disqualified.

Contest Dates

The First Annual National CW Championship Contest is at 0000–2400 UTC on September 5, 1987.

The First Annual National SSB Championship Contest is at 0000–2400 UTC on September 6, 1987.

Eligibility

Open to *single-operator stations* within the *50 U.S. States only*. A station must be capable of operating two or more bands; there are no single-band categories. Eligible bands include 10, 15, 20, 40, 75/80, and 160 meters.

Miscellaneous Rules

Stations may operate only *18 hours* of each 24-hour contest. The same station may be worked *once on each band*. For stations submitting a contest entry, *external amplifiers are strictly prohibited*. Exciter output must not exceed 200 Watts.

Mandatory Band Switching

This rule separates the men from the boys. Read it over several times, as it is the toughest rule to interpret. Be sure you understand it! Violators must be disqualified and their entries processed as check logs.

Stations submitting an entry must operate only on a single band during the following time frames: 0000–0300 UTC, 0300–0600 UTC, 0600–0900 UTC, 0900–1200 UTC, 1200–1500 UTC, 1500–1800 UTC, and 1800–2100 UTC. In other words, you must establish a band within a time frame and *cannot* move from that band until the next frame. *At no time from 0000–2100 UTC may you work the same band during two consecutive time frames*. At least one time frame must pass before the same band can be worked again. *From 2100–2400 UTC only* may stations switch to any band as often as they like.

Exchange

All stations must transmit RS(T) and U.S. State.

QSO Points

10 QSO points per valid QSO on 10 or 160 meters. 5 QSO points per valid QSO on 15, 20, 40, or 75/80 meters.

Multiplier Points

1 multiplier point for each state worked on 15, 20, 40, or 75/80 meters. 2 multiplier points for each state worked on 10 or 160 meters.

Multiplier Average

Multiplier average is determined by totalling all multiplier points and dividing them by the number of bands operated.

Antenna Multiplier

3 Antenna Multipliers for each band worked with a wire antenna design or vertical antenna. Antennas must be fed with a single feedline and not be in a phased configuration. Quads are not considered wire antennas!

2 Antenna Multipliers for each band worked with a duo-, tri-, or quad-band antenna fed with a single feedline and not in a phased configuration.

1 Antenna Multiplier for each band worked with an antenna not specified in the previous two categories.

Note that more than one antenna may be used on a band but *only one antenna may be used at a time*.

Final Score

QSO Points x Multiplier Average x Antenna Multiplier = Final Score.

Contest Entry

Entries must include a separate log for each band worked, a summary sheet itemizing QSOs per band, QSO points per band, multipliers per band, antenna multipliers per band, and total accumulated score. Entries must describe antenna used on each band and sign a declaration that the contest operator abided by the contest rules.

Entry Deadline

Entries must be *postmarked* and forwarded to the contest address below no later than October 20, 1987.

Rules, Forms, Entries

Forms are available from the contest committee. Send an SASE to: The National Championships, 2665 Busby Road, Oak Harbor WA 98277.

Disqualifications

Contestants not following the band-switching requirements will be disqualified. Stations falsely reporting antennas used or falsely reporting output power will be disqualified. Scores requiring more than a 3% scoring adjustment due to duplicate contacts or scoring errors will be disqualified. Contest committee decisions are final!

Penalties

A penalty of one multiplier point, before averaging, will be assessed for each duplicate contact count on the same band and not discounted by the contestant on his/her entry.

Awards

A minimum of 250 QSOs must be worked to be eligible for awards. Awards will be issued to the operator with the most points in each *Call District* and *U.S. State*. Plaques will be issued to the National SSB Champion and National CW Champion.

The CONTEST OPERATOR OF THE YEAR TROPHY will be awarded to the contester with the highest combined score for the two contests. ■

Send For Your National Championship Entry Forms Today

The National Championships
2665 Busby Road
Oak Harbor, WA 98277

Yaesu FT-690R II 6-Meter Multimode Transceiver

Tonna 50/5 5-Element 6-Meter Yagi

Yaesu USA
17210 Edwards Road
Cerritos CA 90701
Price Class: $570

by Peter H. Putman KT2B

Tonna Antennas imported by:
The PX Shack
52 Stonewyck Drive
Belle Mead NJ 08502
Price Class: $125

Photo A. The Yaesu FT-690R II configured for mobile operation.

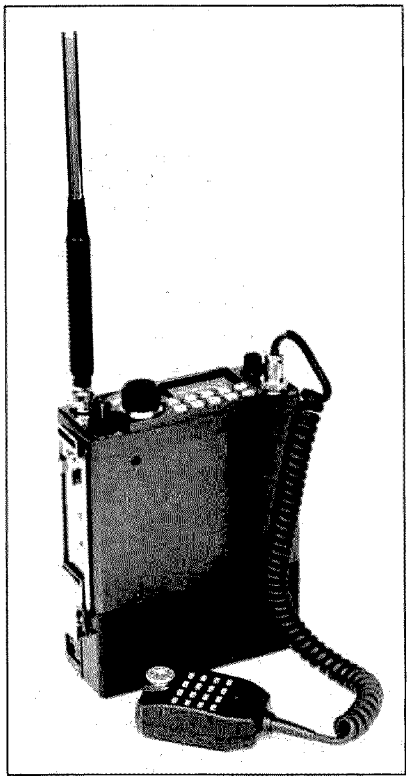


Photo B. The Yaesu FT-690R II configured for portable operation.

Readers of last month's FT-290R II/Tonna 144/9 review will recall how enthusiastic I was about the combination of this radio and antenna for 2-meter portable operation. Since that review worked out so well, I decided to take the same approach on 6 meters with this month's two products—and wound up having almost as much fun during the 50 MHz Spring Sprint.

The FT-690R II

Let's begin with the FT-690R II. The design approach here is similar to the FT-290R II—a combined mobile/fixed/portable multimode station in one package, using interchangeable battery cases or a snap-on final amplifier and heat-sink assembly for higher power. The FT-690R II uses the same accessories as the 2-meter version, including FBA-8 battery case, FTS-7 tone squelch unit, MH-10F8 speaker/microphone, and MH-15C8 DTMF microphone.

The NiCd charger is interchangeable, and so is the mobile mount. About the only unique accessory is the YHA-6 telescoping whip antenna, with a base-loaded coil measuring just over 40" long.

The big difference between the 690R and 290R is the output power when using the external amplifier: 10 Watts versus 25 Watts. I asked Chip Margelli of Yaesu why the difference. He said that 25-Watt power modules for 50 MHz are difficult to come by in Japan, but 10-Watt modules are not. Certainly an interesting situation, especially when one considers the popularity of 6 meters over there! Perhaps in the near future, a retrofit 25-Watt module can be developed. (Using discrete power devices would be out of the question, considering the size of this amplifier assembly.)

> ***"The FT-690R II represents a great value in a 10- or 2.5-Watt do-it-all, 6-meter rig."***

The front-panel layout is nearly identical to the 290R II: 10 push-button keys control most of the functions, such as vfo selection, mode, tuning rate, repeater offsets, priority channel, high/low power, memory, and scan functions. The nameplate is finished in orange, as opposed to green for the 290R II (I guess to prevent confusion when in a hurry). The other basic controls are for volume, squelch, main tuning, and clarifier (RIT to the rest of us).

The modes available for operation are also the same as on 2 meters: USB, LSB, CW, and FM. The tuning rates on SSB and CW are selectable at 25-, 100-, and 2500-kHz steps; on FM they are 5-, 10-, and 20-kHz steps, respectively. The available offsets for repeater operation are either + or − 1 MHz, which is pretty much standard on 6 meters.

As with the 290R II, you can store frequency, mode, and offset information on any of ten channels, as well as scan between those channels. However, once a channel is selected through the memory switch, you cannot make excursions off that frequency. For example, you may wish to jump quickly from a repeater near 53.500 MHz to the SSB calling frequency of 50.110 MHz. You can do this with two memories, but to move up or down in frequency thereafter you must go back to either vfo. This is inconvenient, but more so on the 2-meter version. The clarifier control provides for some adjustment of the received signal, but does not alleviate the problem.

You can also split the two vfo's for half-duplex operation instead of using the standard 1-MHz offset. This is handy if you encounter a nonstandard-offset frequency pair. I can't

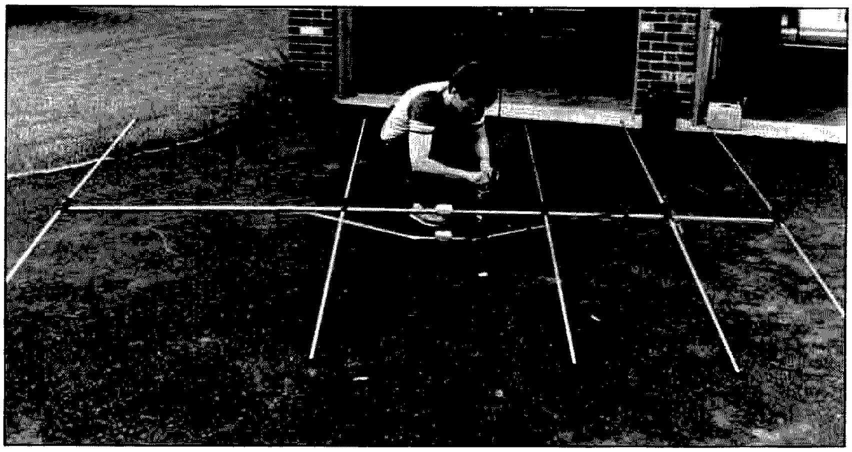


Photo C. Dave Skarbowski N2FAM puts the finishing touches on the Tonna 50/5 five-element, six-meter yagi.

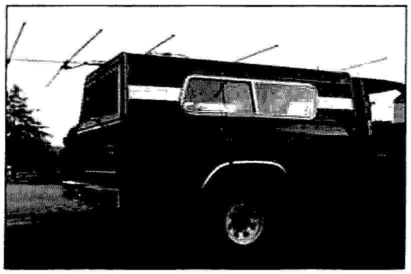


Photo D. The Tonna 50/5 ready for trucking to the contest site.

forsee frequent usage for split vfo's on SSB or CW, as all operation on 6 meters is usually full transceive. (There might be the odd case of a DX station on CW working stations in the phone segment above 50.100 MHz, making the dual-vfo scheme practical.)

The FT-690R II lends itself well to mobile operation, although the right side spring bracket screw disappeared in transit from Yaesu, making the installation very difficult! Fortunately, a phone call resolved the problem, and a replacement spring and collar soon showed up. As with the FT-290R II, the amplifier module can be secured to the mobile bracket separately. The panel light is always enabled while operating off an external dc supply or battery with the power amplifier module. When the FBA-8 battery case is installed, you have to actuate the panel light separately, which of course saves unnecessary battery drain.

Now for a major problem. I found the display impossible to read in my Honda when I was wearing polarized sunglasses! The mounting place was conventional—under the center of the dashboard behind the stick shift. This was also the case on the FT-290R II, as a very unfortunate combination of the angle of the LCD screen and my polarized lenses turned the display almost black. I had to remove my glasses to change frequency, or tilt my head! A stronger backlight might overcome this problem—one I've never encountered before with LCD displays.

"The Tonna 50/5 is very light and a piece of cake to assemble."

Another problem with the MH-15C8 DTMF microphone was an almost complete failure of the DTMF keypad, resulting in only one tone from each pair being transmitted 90% of the time. Playing with the keypad buttons and a local receiver showed a clearly defective contact point on digits 5, 8, 3, 6, 9, and #. In other words—most of the pad. I attribute this to poor quality control on Yaesu's part. In the end it made no difference, since I never use DTMF operations on 6 meters.

The Tonna 50/5

Now for a look at the Tonna 50/5. Once again, the folks from France have come up with a clever scheme for a workaday 5-element yagi with reasonable gain and front-to-back ratio. The yagi electrically is .57 wavelengths, measuring 11′ 3-3/4″ and weighing in at just 14 pounds. This number is achieved by using rolled light-gauge aluminum stock to form the elements—similar to those used in television antennas. The elements are quite strong, although not like seamless aluminum stock. The boom is the conventional Tonna square stock, which is very rigid and easy to align elements and brackets on.

Tonna specifies the gain to be 10 dBi—about what you'd expect for a 5-element yagi on this length boom. The F/B ratio is −23.8 dB, but the front lobe is fairly broad with the −3 dB points encompassing about 75 degrees in the H plane. The antenna is not terribly sharp! For my purposes, though, the broad pattern was actually helpful since I was running QRP and rotating the antenna manually.

Assembly is a story in itself. Why is it that only the French can come up with such an easy-to-build yagi? I don't think it has ever taken more than a half hour to construct any of the Tonna products (with the exception of the 23- and 55-element 1296-MHz yagis). Everything is well marked, the parts count is correct, and the parts fit in good alignment—an assembler's dream. It was the same with the

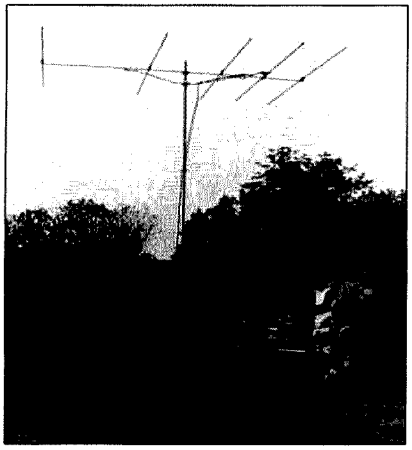


Photo E. The Tonna 50/5 set up at the contest site.

Photo F. KT2B operates the FT-690R II—2.5 Watts output to the Tonna 50/5.

50/5; I virtually ignored the instructions and worked from intuition.

The only flaw I could find was that the assembly manual showed no suggested starting point for the Beta match connections. This point was determined to be about 1-1/2 inches from the ends of the Beta rod, after much on-site experimentation with a Bird 43 and 5C slug. However, the Beta rod tuning is quite forgiving, as the worst swr measured at 50.100 MHz was the starting point, with the clips 1 inch from the ends of the driven-element support. Here, I saw over 2:1 swr. At the final set point, the measured swr at 50.100 MHz was better than 1.3:1. (These tests were taken with the yagi only 15 feet above ground, so I'm sure that ground effects exaggerated that number!)

The clamping method is unique: The rolled ends of the elements are isolated from the boom with special molded-plastic holders, and held in place by a compression nut (which is coaxial to the element) and ferrule arrangement. You slide the element all the way into the holder, then tighten the nut around the clamp point as needed. Result? You can't pull the elements out at all without causing major destruction to them—unless you loosen the nut, at which point they slide out like butter.

This in effect creates an antenna suitable for portable work. Just mark the element pairs with colored markers (or measure them on site—all five pairs are different lengths), then assemble the boom into three pieces and carry the elements bundled together. Once on site it takes about 20 minutes to put together. The only tool required is the ubiquitous 10mm wrench! The compression nuts can be tightened by hand, and the wrench takes care of the boom-to-mast clamp. The various boom sections and boom brace are secured by plastic wingnuts—how's that for simple!

The 50 MHz Spring Sprint

It seemed that the FT-690R and 50/5 were a marriage made in heaven, or at least in Pennsylvania. The next step was to find out how well that marriage worked, and the venue was the ARRL 50 MHz Sprint, held the Saturday of Memorial Day weekend. One of my neighbors to the north, Dave Skarbowski N2FAM, was enlisted to provide his truck for transportation and find an operating site nearby. (Actually, he volunteered, if you can believe it. Most people who know me expect to sit on a frozen mountaintop for hours when I ask if they'd like to "come along and help out" during a portable operation.) The site he chose was an open field of several acres nearly 540 feet ASL, putting it about 50 feet above average terrain.

We pulled up after 7 p.m. and within a short time had the beam up and were listening to all sorts of CQs from local stations. The band was dead, however, and the Q rate very slow. Initially I elected to use the battery case and just 2.5 Watts, and we did make contacts into Delaware and northern New Jersey in short order. K2BWR was worked in Atlantic City with good reports, over 50 miles away. As I mentioned earlier, it actually was handy to have the somewhat broad pattern on the 50/5 since all kinds of CQs were answered off the sides of the antenna (as well as a few off the back).

Around 9:30 p.m. the band did open to Texas and Arkansas, with an occasional ping to Missouri and Kansas. But the 2.5 Watts just wasn't enough. Even the 10-Watt final amplifier wasn't enough! It took over 40 calls before I finally bagged KB7IJ/5 in grid square EM12 (near Dallas). Still, 1000+ miles is nothing to sneeze at. K5GW and K5UR were also heard running 20 over S9 at times, but I couldn't bag 'em. There's a big difference between 144-MHz and 50-MHz QRP operation: On 2, you can plug away with your 2.5 Watts and work a lot of stations running 100 Watts or less, but the majority of serious 6-meter operators are pushing a kilowatt. Of course they'd be S9 + 20 dB during an Es opening! That means with my 2.5 Watts and 10-dB antenna, I'm still giving up almost 16 dB in signal answering their calls. Thank you, KB7IJ, for persevering.

The final totals weren't too great—16 stations in 4 grids—but the Sprint did prove to me how well the receiver worked near adjacent strong stations. Front-end sensitivity was excellent, making my job of operating QRP all that much more frustrating! Ah well, at least we saw some beautiful star formations and a great sunset. Dave contributed a few cold beers as well, and we had fun taking pictures of the setup.

The final step was to put the FT-690R II on the bench and through its paces. I was mostly concerned with sensitivity, since I couldn't easily measure dynamic range. The latter was estimated at about 110 dB+ based on contest observations.

Conclusions

There you have it—the 6-meter portable station for today. Both products work very well in the field—especially together! The FT-690R II represents a great value in a 10- or 2.5-Watt do-it-all, 6-meter rig for base, mobile, or portable. You can easily add a 100-Watt "brick" for more juice if needed. It would be nice to have some provision for a tight filter option as well as being able to set the vfo's instantly to any memory channel as a starting point. The display polarization problem is unfortunate, but might only have been caused by that particular pair of sunglasses.

Before you ask, there is a FT-790R II on its way to the U.S. market. I'll review it in conjunction with the Tonna 21-element portable 70-cm yagi, so look for that review in the future!

The Tonna 50/5 is very light and a piece of cake to assemble. (It's so light in fact that I'd like to see a longer version with a tighter pattern up front—say, about six or seven elements.) The construction is first-rate, although the instructions could be more helpful regarding the Beta match. No doubt stacking two of them (easily done) would improve and sharpen the pattern. Overall, it is an ideal portable contest antenna and uses simple assembly techniques that anyone can deal with.

For more information about the FT-690R II, circle number 201 on your Reader Service card. For more information about the Tonna 50/5 yagi, circle number 202 on your Reader Service card. ■

Specification	Claimed	Measured
Minimum Discernible Signal	n/a	> −130 dB
Sensitivity		
10 dB S/N	.2 uV SSB/CW	.2 uV
12 dB SINAD	.25 uV FM	.25 uV
Squelch Law	n/a	.12 uV FM
		.2 uV SSB/CW
Selectivity, −6 dB/−60 dB	2.4/5.2 kHz SSB	n/a
	12/25 kHz FM	n/a
Power Output at 50.100 MHz	10 Watts High	10 Watts High
With FL-6020 Amplifier	2.5 Watts Low	2.5 Watts Low
Power Output at 50.100 MHz	2.5 Watts High	2.7 Watts High
With FBA-8 Battery Pack	n/a Low	300 mW Low
Current Drain	80 mA Receive	n/a
	1.1 A (2.5 W)	n/a
	4 A (10 W)	n/a
TX/RX Coverage	50–54 MHz	50.000–54.000 MHz

Table 1. Performance measurements for the Yaesu FT-690R II.

Gain, dBi	10.0
Electrical Length	.57 wavelength
F/B Ratio, dB	−23.8
−3 dB Points	75 degrees H plane
	55 degrees E plane
Swr	Better than 1.2:1 from 50–51 MHz
Gain Bandwidth (−1 dB)	48.5–51.6 MHz
Length	11' 3-3/4"
Weight	14 lbs.

Table 2. Specifications for the Tonna 50/5.

Heath HW-9 QRP CW Transceiver

by Mike Bryce WB8VGE

Heath Company
Benton Harbor MI 49022
Price Class: $200

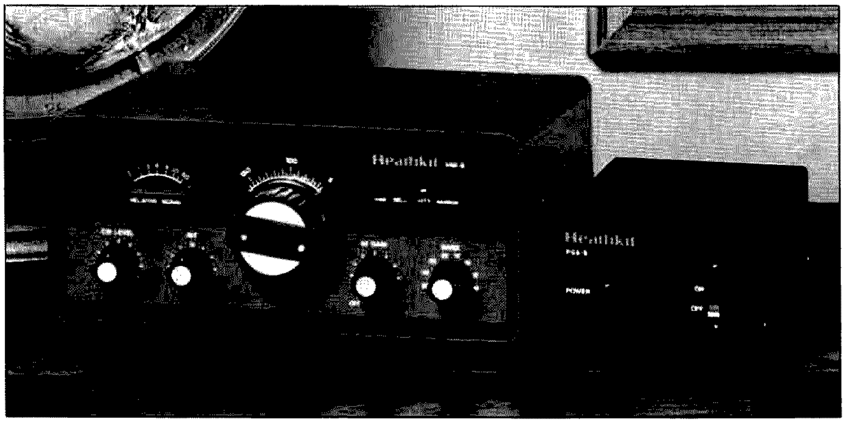


Photo A. The Heath HW-9 shown with the optional PSA-9 power supply.

The HW-8 is a tough act to follow, but the Heath Company is betting on the HW-9 to take over now that the HW-8 is no more. After selling more than 15,000 units, Heath quietly removed the HW-8 from their catalog. This left a vacuum in under 5-Watt transceivers, since Ten-Tec also dropped the Argonaut 515. No one seemed too eager to fill this void. That is until now, with the HW-9, a third-generation QRP transceiver from Heath.

The HW-9 is a CW-only transceiver that covers 80 through 15 meters. With the accessory HWA-9 band pack ($30) you can extend coverage to all the WARC bands and the lower 250 kHz of 10 meters. The HW-9 also has full break-in keying (QSK) plus a newly designed wideband front end for no tune-up operation.

I really don't know why Heath supplies screws for any of their radios—everyone who comes to my shack wants to see the insides of the newest Heath creation. Inside there are not one but two circuit boards, the oscillator and T/R circuit boards. Neither of the boards is double-sided, and both the boards are the same size as the case. It's quite crowded inside the HW-9, perhaps because Heath used the same size case as the old HW-8. They must have had some extra ones lying about in the metal shop. Gone is the infamous two-tone Heath green color scheme; in its place is a new bronze paint job.

Features

The front panel has also been redesigned. Band selection is now done via a rotary switch instead of the older push-buttons, as was the case with the HW-8. Yelling and screaming from HW-8 users helped add two new features to the HW-9: receiver incremental tuning (RIT) and a superhet receiver (to succeed the often-cursed direct-conversion receiver that the HW-7 and HW-8 sported). The superhet receiver utilizes a 9-MHz i-f and a four-pole crystal filter. An improved active audio filter and an audio amplifier that will drive a speaker or low-impedance headphones round things out for the receiver. The front-mounted meter gives relative S-units during receive and functions as a relative output meter during transmit.

The transmitter this time around had the power boosted to 4 Watts output on all bands except 10. You'll get 3 Watts out on 10 meters. A front-panel control will vary the transmitter output from zero to full power. The power amplifier is made up of two transistors in parallel to produce the rf output. A zener diode straps the collectors of both transistors to ground for protection against high swr on the antenna. The HW-9 requires an external power supply that can supply 12.6 V dc at at least 1 Ampere. (Heath's PSA-9 power supply kit costs about $20.)

Construction

Of course the HW-9 comes in kit form. I was surprised to see that only two pages of changes were included. What can I say about the manual—classic Heathkit. I started construction by first cleaning off my work table, a major undertaking in its own right. I have to fess up a bit. Whenever I build a Heathkit, I never check parts off until they are ready to be installed. I do group like parts together in small piles: resistors in one pile, transistors in another, etc.

This HW-9 is the first Heathkit that I've assembled that uses taped components. Resistors, diodes, and small glass capacitors are mounted on tape strips. Each circuit board is set up in sections. By locating the proper taped parts, all one has to do is stuff the correct section. This sure is different from what I have been used to in the past from Heath. I did have some trouble with this new system. I started to go too fast and ignore the check-offs in the book. Somehow in the wee hours of the morning, I got screwed up and installed parts in the wrong place on the T/R board. I recommend a slow pace when installing the taped components.

Photo B. Rear panel of the HW-9.

Construction begins with the oscillator board. Things went along quite well for a while until trouble raised it's ugly head. The oscillator circuit board seemed to have a lot of extra holes left over after all the taped parts were installed. Hummmm, seems these are for the optional WARC band kit. Well take it from me, install the WARC band kit while you're assembling the HW-9. To do so after the fact will involve a terrible amount of work.

The T/R board is quite dense. Use extra care with the tape components. There are 2 coils which must be wound for the transmitter. These must be done correctly or the transmitter will not work. After the boards are stuffed, cables are used to interconnect the different circuits. Instead of the usual Heath wiring harness, you make up your own. Small labels are used to mark the coaxial cables. After checking the soldering on both boards, you can finally get down to putting things together.

Mechanical assembly went smoothly. The end was in sight. Vfo capacitor and front-panel controls were added to the chassis. The HW-9 started to take shape.

Alignment

After all the parts are installed, we can start some resistance tests. Now I have to confess that I'm not much for doing resistance tests when building equipment. I did a few and things looked good, so I went on to alignment.

Alignment of the HW-9 requires the use of a VTVM or DVM, a frequency counter with a range to 10 MHz and an accuracy of .01%, and an rf detector—which Heath has built into the transceiver.

Everything seemed to be going just fine until I came to the vfo. Try as I could, I could not seem to get the vfo to track the dial. I spent most of an evening working on the problem. Oh, I did get things to perform, only after I discovered that the main tuning dial slips. In fact, it slips a lot. The next morning I called Heathkit. Yep, we know of the problem, not much you can do, but here are some suggestions. Remove the vfo shield (the shield causes some binding). Reset the vfo capacitor (this may also cause some binding). Don't tune past the stops (this wears down the vernier drive). Well, I did all of the above and it worked, sort of. It appears that Heath, in order to keep the HW-9 the same size as the HW-8, had to use a much smaller vernier drive. The

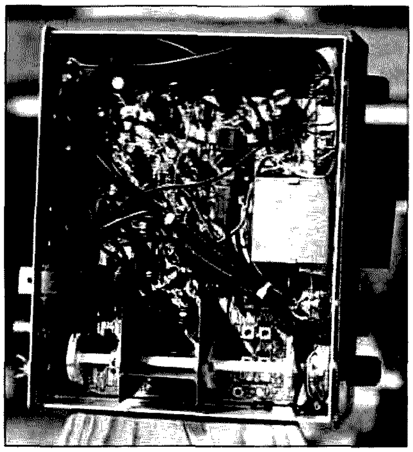


Photo C. Inside the HW-9.

new drive is way too small for the job of tuning the vfo capacitor. What I finally did was to disassemble the vernier drive, bend the spring washers to add more drag, and reassemble it. So far, so good—I have not had any more trouble with the drive slipping.

Having fixed that problem, alignment continued along smoothly for several more manual pages—until I came to the page containing the transmit bandpass alignment. While I didn't have trouble with the alignment proper, the way it has to be done is a real pooper! To adjust the coils for the 15-meter band, you have to remove the bandswitch shaft. That's not much fun. Reinstalling same shaft is even less fun. Take your time and things should go smoothly, I hope.

The balance of the alignment went without a hitch. Finally, I was able to press-on the blue and white label to the bottom cover. The HW-9 was done.

Operation

Operation proved a pleasant surprise. After the sidetone was adjusted to my liking, I fired up on 40 and gave a quick listen. The receiver proved quite sensitive. The S-meter is a bit scotch, but can be adjusted to the end user's need. I had some audio howling when I went to a band position that was not active (I did not install the WARC kit). I had one of the i-f stages oscillating; re-tuning the coils remedied the difficulty.

With a bit more kick out of the transmitter, I was able to work just about everything I heard. The QSK, while not quite up to Ten-Tec standards, worked flawlessly. I like the QSK time to be a bit slow and was able to set the time to my liking. The RIT and the audio filters work well. A speaker plugged into the HW-9 provides plenty of audio.

Will the HW-9 replace the HW-8? It sure has a good start. With all the features that everyone wanted on the HW-8, plus no-tune operation and WARC coverage, the HW-9 will fit the needs of the low-power operator. The HW-9 is a solid performer. QRP operator, Novice, or CW buff will find it a welcome addition to the shack.

For more information about the HW-9, circle number 203 on your Reader Service card. ■

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The Year 2000—Packet Radio Then and Now

The author predicts packet radio of the future—using today's technology!

Any attempt to look into a crystal ball and predict new ideas and technical developments ten years from now will be about as successful as the predictions of a 1920's airline executive trying to quess the business future of air travel before the invention of the jet engine. It is possible, though, to visualize where application and experimention with currently available techniques and equipment (plus hard work) could take amateur radio digital communications in 10 years.

The year 2000. . .due to continuing politico-technical problems our three sync-orbit satellites that would provide world-wide communications coverage are still waiting for a ride into orbit. Currently, we have a microwave relay system providing 24 hour/day networking for the USA and Canada as well as several paths linking up through Central and South America. This system can handle over a thousand bytes of binary information per second throughput with completely automated routing to destination. Entry and exit of data for this microwave system is through several hundred gateway nodes, each servicing a local area. The best description in late 80's terms for one of these gateways is: a very smart bulletin board with several ports on local VHF channels and at least two full-duplex, 10-MHz bandwidth microwave links to adjacent gateways. Each of these have at least 50 megabytes of RAM-disk on line and a hundred times this in CD-ROM data base. Traffic on the microwave system consists of blocks of binary data providing a transparent system for the many modes of digitized voice, video graphics, and data-compression schemes used to update gateway memories to current conditions.

During a local or national emergency, any one of or group of gateways gain priority status and can deliver hundreds of messages per hour to and from addresses within local areas. Because of the complexity of the rf and digital systems involved, few of these gateways are individual amateurs. Most gateways are the result of the combined effort of public-spirited groups and clubs who have found a way to really serve the public need for emergency communication on a nation-wide basis, and also provide a new service for hundreds of local amateur operators who need only a TNC to access their local net.

> *"Currently, we have a microwave relay system providing 24-hour-per-day networking for the USA and Canada, as well as several paths linking up through Central and South America . . ."*

There are severe problems with the hordes of youngsters who have become digital hams to gain time on the data bases and interactive strategy games. . .

1987. . .Every bit and piece of hardware and software needed to implement the system described above is already obtainable by amateurs. What is lacking is the time and effort to put the system into operation 24 hours a day, 365 days a year. Any amateur who is operational today on packet using a TNC from Kantronics, AEA, PacComm, or Tink-2 (or look-alikes made in the last year or so) is ready now. Due to Paul Rinaldo W4RI, we have an adequate standard protocol—AX.25—for local area operation. Two-tone 1200 baud AFSK simplex has been obsolete for ten years, but it has one very big advantage—it works like a charm through "standard" voice-type FM repeaters for local networking and terminal-to-terminal operation. A simple agreement to limit packet operation to "emergency only" during commuting hours will usually allow full operation the other 20 hours/day on these super-repeaters with area- and state-wide coverage. The last ten years have seen a steady improvement in equipment and coordination in amateur digital operation, much of which is based on the inspiration and perspiration of VE7APU and the VADC group.

There is one notable exception to this curve: a steady, well-implemented, and self-serving promotion, by various groups and suppliers of packet equipment, which has created the impression that their TNC makes every station a repeater that is able to network a national traffic system on the same channel used for local traffic. Single-speed digipeating can serve a very useful purpose outside of metropolitan areas where channels without local activity are available and reduction of throughput by 50% is acceptable, but any system that attempts routing of traffic outside his local area by individual operators is doomed to failure during an emergency. The bright side of this is that if increased traffic through multi-digi's hadn't created such a problem, WØRLI wouldn't have started the development of the missing link that makes long-haul traffic practical. This is real amateur spirit. . .find about $100 worth of computer surplus, sweat out hundreds of hours of programming time to adapt this to current TNC standards so that anyone can use it, and then give the program to any ham that sends him a blank disk. The next time you check into a bulletin board, think a moment about the contribution of WØRLI and the many others who have added their efforts to make these PBBS's into gateways that do automatic-message forwarding. The next time you are in the middle of an interesting packet QSO and someone accesses a PBBS with a four-page help menu on a three-hop digi-link through one of your locals that leaves his digi on, realize that the problem lies not with the PBBS, but with the lack of digipeater operation coordination.

The latest PBBS listings show more than a hundred now in operation and those spread out over the whole country, most on a 24-hour-a-day basis, and most able to receive and forward traffic to other gateways as well as serve their local area. This is a giant step toward a national traffic network. Still it cannot handle the reasonably large bursts of traffic that any emergency would create. The program requires routing information either from the incoming port or the sysop of the PBBS. It forwards this on a time schedule without considering traffic load or alternate

routing to compensate for an overloaded gateway or equipment outage. As the volume of traffic grows, the system at some point crashes due to the "white-lightning" effect. This is the common term used to describe a digital communication system that tries to handle one byte more of data of throughput than error correction can manage. The system then requires reset and complete re-boot.

It will be some time before the WØRLI PBBS problem becomes serious, particularly away from large cities or the common paths between E/W or N/S heavy traffic centers. A few weeks ago, Kantronics started shipping an accessory package. It can be field-installed in less than an hour in any TNC. The package brings the TNC up to their latest version, adds 32K of RAM, and implements a self-contained Personal Packet Mailbox (PPM), all for the user-friendly price of about $50. This has been greeted by the packet community and competing manufacturers with a dull ho-hum. Everyone knows that you need at least 700K of on-line memory to run a WØRLI-style PBBS that can forward traffic, so it is doubtful if even Kantronics realized that they had provided the solution for the "white lightning" problem! As long as one or more stations in your local group agrees to keep his rf equipment and TNC operational 24 hours/day, an agreement can be made with one or more of the gateways to service any traffic not addressed to a local group member. There is no need to keep one's ASCII terminal or computer turned on or attached.

This Personal Packet Mailbox runs in a background mode and has little or no effect on any other normal operation of that packet station, and like any polite child, only speaks when spoken to. There is no way that the sysop can make it transmit anything, yet any station on the channel can call and service any addressed traffic. Of upmost importance, the PPM lists amounts of unused PPM memory, allowing the gateway inquiry to make automatic decisions about polling interval. This includes unloading local traffic to give the PPM some space until things slow down to normal or replacing it with a short summary so local stations are alerted.

To begin with, minor program changes in any WØRLI PBBS will allow a simplified form of this mode of operation, which may be called "forward on request", until someone thinks of a better name. The first advantage will be that the gateway can use a narrow-pattern, high-gain antenna, controlled by the computer since all the exchanges of data in this mode are initiated by the gateway. After a reasonable period to allow his locals to appreciate a fast-reaction local PPM serviced by a gateway, he can close down all direct traffic entry from individual stations to start the interesting job of reprogramming the gateway into a point-to-point relay between adjacent gateways and star-network controller for traffic in or out of his region. During periods of no traffic, gateways will update each other's data bases with preferred routing based on current system capabilities and traffic load history, lists of all active calls on local packet nets, etc.

The 1-MHz CPM Xerox™ board and klunker 8" drives are going to run out of gas very soon, but a turbo-XT Clone or an 8-MHz SBX-180 with hard disk should take you into the late 90's and not bend the budget of even a medium-sized amateur club beyond recovery. Programming must be flexible, adaptable to local agreements and protocol between the PPM's and their gateways, and expandable to keep up with the needs of point-to-point relays to adjacent gateways. This would be an ideal joint public service project, for groups such as local packet-operator clubs, computer-user groups, and FM repeater clubs that have good rf sites in the area.

"The latest PBBS listings show well over a hundred now in operation and spread out well over the whole country, most on a 24-hour-a-day basis, and most are able to receive and forward traffic to other gateways as well as serve their local area."

The 1200-baud AFSK AX.25 protocol should be more than adequate for local groups using 145-, 223-, 440-, 915-, and 1296-MHz NBFM channels during the next few years. However, during a local emergency, one gateway may be called on to service 15 or 20 of its PPMs loaded with out-of-state traffic. Let's hope that by this time the gateway has had at least one solid microwave point-to-point link to another gateway in a direction away from the problem area with a throughput of data rate that will occupy several MHz of band-width out of the over 1000 MHz presently allocated to us between 2.3 GHz and 10.5 GHz. What protocol is used by the microwave links? It is whatever the two ends of that path like and find reliable. A block of data being relayed 3000 miles may go through several protocol and data-rate changes, be forced to back-track many hops, and rerouted around a blown fuse in a remote site, and still be sitting error-free in a local PPM near the addressee in a matter of minutes.

We can't wait for the select committee of the ARRL to agree on a level-3 network protocol; they have been discussing this already for five years. Even if the overall requirement of the protocol they are searching for (I suspect) is software that can be spliced into AX.25 and run in a TNC that is plugged into the jacks of an unmodified HT, it's much too late and far too thin to be of any real value.

I am not just taking a cheap shot at the members of this group; quite the contrary, I have the greatest respect for their efforts and technical contributions to amateur radio—W4RI and VE7APU in particular. We've all been through the same school of practical experience in the communications field. Those with rf backgrounds have always tried to pack information into the narrowest possible bandwidth to improve signal/noise ratios or to fit into the cracks between immovable objects. The digital types are totally focussed on protocols developed in the past 50 years of communicating through a wired network where the operating costs go up exponentially above 10 kHz of bandwidth. After looking at the trees for too long, it is time to back up and again look at the forest. This is 1987, and we have an urgent need to move large blocks of data from point A to point B in a reasonable length of time and at an affordable cost. We can use all or any part of the following bands of frequency: 2300 MHz with 70-MHz bandwidth, 3300 MHz with 200-MHz bandwidth, 5650 MHz with a 275-MHz bandwidth, and 10000 MHz with a 500-MHz bandwidth. You can buy new GaAsFETs for less than $25 for low-noise RCVR front-ends, cheap used Tele-Vision Receive-Only (TVRO) dishes for antennas, and, if you dig down under the computer scrap at your next flea market, you might find Traveling Wave Tubes (TWTs) that will put out 1-10 watts on these bands.

If you are still with me after this long dissertation, you are hooked and might as well start High-data Rate Microwave Relay Kindergarten with us. The technical group of the Cherryville Repeater Association has started to put together both ends of a 70-mile, one-hop relay link northwest into a site in Pennsylvania that has a clear shot toward Ohio. We are starting with 19.2 kB of pure binary data at 100 kHz or more of bandwidth, with 20 watts of 2.3 GHz feed-point power and under 2-dB NF Rcvr on each end. I think we may be in the first grade this summer, so drop a message into your nearest packet gateway to K2TKN via WB2GWD and we will do two things—keep you informed of our learning curve and keep track of delivery time so we can score on the whole packet traffic system as it expands into a primary public-service communication pipeline.

You might also drop a note to a famous publisher of a well-known amateur radio magazine that a public service donation of a data base in CD-ROM or Worm, containing the USA Callbook would furnish a key system block that none of us can scrounge.

The Year 2000—I forgot to mention that there are still many very loud signals calling CQ DX and the same familiar types dog-fighting in the pile-ups to see who can flat-top their speech processors so they can be king of the hill for the day. OH WELL.. ■

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AI on Packet?

TRON is a computer program that will simulate a live operator. It is written in Basic and runs your packet station while you are busy doing other things. There are no external interfaces except for the normal TNC found in almost all packet stations. It is fun for those who check in to your station, and will amaze your friends. At first glance, one might think that you are using an artificial intelligence (AI) program in your computer, although this is not strictly the case.

I wrote TRON on a TRS-80 Model 4 computer, but it could easily be adapted to other computers running Microsoft Basic. I will explain the workings of the program and give you tips on what areas you would need to change for your computer.

How The Program Works

The program accesses four files. The first, TRON/LOG, is initialized while in DOS before the Basic program is run. The next is CALLFILE/DAT, which contains calls and operator names of previously worked stations. The third file NAMECHK/DAT, a list of words used for checking the validity of names, is built with a word processor. The last file, RESPONSE/DAT, is also built with a word processor and is the first file you will want to alter after you have the program up and running. This file is also used to customize the Robot to your operation.

I used the DOS command ROUTE to access the disk and to save a copy of communications in progress, since ROUTE does not interfere with communications coming in on the RS-232 line. The communications driver of the DOS (COM/DVR) was used, and the SETCOM command was used to set up our parameters. This makes programming simple, since the power of the DOS can be used to route the printer to a disk file named TRON/LOG. You must do the route from DOS Ready before entering into the Basic program, since this sets aside memory for the Route. The COM/DVR is then set and a SETCOM done. How to do this will be shown later in the article.

The first thing the program does is load the arrays for the call/name array, the response array, and the name-checking array. This takes place in line 130, with a GOSUB to each routine. To enable the I/O interrupts in line 160 do an OUT &HE0,0.

Next, commands are sent to the TNC to make sure that the configuration is right for our operation. This takes place in lines 170 and 175. You may want to make some changes here, since your operation type may be different from mine. The reset command may be a different word in your TNC. In mine, which is Kantronics, RESET is a soft reset and doesn't change any parameters. I think the AEA uses RESTART (check your manual). LOCK OFF causes everything coming to the computer from the TNC to be in upper case, which makes the selection of key words easier.

"I wrote TRON on a TRS-80 Model-IV computer, but it could easily be adapted to other computers running microsoft Basic."

To read the RS-232 port and see ifdata is coming in, take a brief excursion via GOSUB 400 to see if the operator has entered a command from the keyboard. We are looking for 256 characters—the maximum size of a packet—coming into the port. If a carriage return comes in the packet is terminated and printed. And, if the line printer has been selected, a copy will go to the line printer. If the disk option has been selected, the material that would go to the line printer will go to disk.

We now have a complete packet and must select a response to send. The first step is to identify what was received in a packet by going through the array of key words from the RESPONSE/DAT file and searching for the occurrence of that particular string in our packet string. The matching response is picked when a match is found.

The first packet received when being connected to, is the "CONNECTED TO" packet. This triggers a particular series of events. The callsign is looked up in the "CALLFILE/DAT" file and if a match is found response number one is sent to the TNC via GOSUB 700. If no match is found, response number three is sent and the program waits for an answer. The answer is checked in the subroutine at line 1700 against the words in the "NAMECHK/DAT" file and, if a match is found in the invalid names list, response number five is sent and an answer waited for.

From this point on we are looking for normal communications (How is the weather?, What rig are you running?, etc.) and responses are sent to each key word received. If no key word is found, the response in the last line is sent. If a "***DISCONNECTED" packet is received, the program returns to the beginning and starts over.

Operating the Program

Operating the program is easy. After preparing the JCL file, at DOS Ready type DO TRON and press ENTER>. The COM/DVR will be loaded and the parameters will be set using the SETCOM command. TRON will be loaded into Basic, the program will come up in the Robot mode, and be ready to receive the first caller. If you want to send all conversation to disk, press "M" and a menu will come on screen. F1 is a printer/disk toggle. Keystroking F2 shows that ON and OFF are toggled. Using F1 and F2 sets the disk to ON. A copy of all communications will now go to the disk.

When exiting the program be sure to use the shift F3 key. This will cause the route from the printer to disk to be reset and also close the file. From the menu press F3 and you will be in the communications mode. Press F3 again and you will go back to Robot mode.

The Data Base

Setting up the data base is the fun part. This is where you enter the responses to the key words that come in on the communications line. The first five key words are a no-no to change. These lines are used in the program for special functions and their position is used in picking the right function. You may change the response to the key word but *don't* change the number at the end of the line. You will notice that each line is composed of:

"key word>", "response 1>", "response 2>", number>

By breaking the response into two parts, we can put the caller's name in the middle or on

either end of our reply. When adding key words you can use words, parts of words, or several words. When using similar words, remember that the program selects from top to bottom. Stack the key words like this:

MESSAGE TO WILLY
TAKE A MESSAGE
MESSAGE

Since computers are very selective, a misspelled word will cause the computer to pick the wrong response or no response at all. In this case the last response in the data base is picked. I sometimes use just parts of a phrase or word chopping off either end or both ends. For example:

TAKE A MESSAGE TO WILLY
MESSAGE TO WILL
SSAGE TO WILL

```
10 REM  VER  1.0  02/17/87
20 REM  FILE NAME  'TRON/BAS'
30 REM  WRITTEN BY  WILLIAM MCMULLAN RT 6 BOX 1 BASTROP, LA. 7122
        0

40 REM  FROM DOS Ready
50 REM SET *CL TO COM/DVR
60 REM SETCOM (B=300,W=8,P=N,S=1,RTS=ON)
70 REM ROUTE *PR TO TRON/LOG
80 CLEAR:DEFINT A-Z
90 DIM D(100):DIM KW$(100):DIM RES1$(100):DIM RES2$(100):DIM CL$(
        100,2):DIM CHK$(20)
100 P1$="** PRINTER":P2$="**  DISK  "
110 D1$=" OFF **":D2$="  ON **"
130 CLS:GOSUB 1300:GOSUB 1500:GOSUB 2000: REM **** LOAD ARRAYS
140 PRINT @(2,2),"** IN ROBOT MODE **";:GOSUB 1600
150 REM OUT 232,0:OUT 232,164:OUT 233,85:REM ** MOD III **
160 OUT &HE0,0: REM ** MOD IV **
170 RES$=CHR$(3):GOSUB 790:RES$="RESET":GOSUB 790:RES$="MONITOR O
        FF":GOSUB 790:RES$="LCOK OFF":GOSUB 790:RES$="CMSG OFF"
        :GOSUB 790
175  A$=CHR$(3):GOSUB 1010:RES$="ECHO OFF":GOSUB 790
180 PRINT @(2,27),"** WAITING FOR CONNECT **";:PRINT @(23,0),"";:
        RES$="":CAL$="":NAM$="":KW1=0:C=0
200 REM ************* READ RS232 LINE ***************
210 FOR Y=0 TO 255
220 GOSUB 400:IF INP(234) AND 128 THEN B$=CHR$(INP(235)) ELSE 220
230 P$=P$+B$
240 IF B$=CHR$(13) THEN Y=255
250 NEXT Y
260 PAC$=P$:P$="":P=1
270 PRINT PAC$
280 IF LP THEN LPRINT PAC$
290 IF P THEN GOSUB 500
300 GOTO 210
400 REM ********** READ KEYBOARD & GOTO FUNCTIONS **********
410 A$=INKEY$
420 IF A$="M" OR A$="m" THEN GOSUB 4000
430 RETURN
500 REM ************* CHECK PACKET FOR KEY WORDS ****************
510 IF KW1=3 OR KW1=5 THEN GOSUB 1100:GOTO 650
520 FOR KW=1 TO Z: REM KW=KEY WORD
530 L=LEN(PAC$):LL=LEN(KW$(KW))
540 FOR X=1 TO L:IF MID$(PAC$,X,LL)=KW$(KW) THEN KW1=KW:X=L:KW=Z
550 NEXT X
560 NEXT KW
570 IF KW1=1 THEN L1=INSTR(PAC$,"TO") ELSE 620
580 CAL1$=MID$(PAC$,(L1+3),10)+" "
590 L2=INSTR(CAL1$," ")
600 CAL$=LEFT$(CAL1$,(L2-1))
610 GOSUB 1200
620 IF KW1=1 THEN C=1:IF NAM$="" THEN KW1=3
630 IF KW1=1 OR KW1=3 THEN SOUND 5,5: PRINT @(2,27),"** CONNECTED
        TO ";CAL$;" **    ";:PRINT @(23,0),"";
640 IF KW1=2 THEN C=0:GOTO 180
650 GOSUB 700
660 RETURN
700 REM ************* SEND RESPONSE *************
710 IF D(KW1)=2 THEN RES$=RES1$(KW1)+NAM$+RES2$(KW1):GOTO 770
720 IF D(KW1)=1 THEN RES$=RES1$(KW1)+NAM$+RES2$(KW1):GOTO 770
730 IF D(KW1)=0 THEN RES$=RES1$(KW1)+RES2$(KW1):GOTO 770
740 IF D(KW1)=3 THEN RES$=RES1$(KW1)+RES2$(KW1)+NAM$:GOTO 770
750 IF D(KW1)=4 THEN RES$=RES1$(KW1)+NAM$+RES2$(KW1):GOTO 770
760 IF D(KW1)=5 THEN RES$=NAM$+RES1$(KW1)+RES2$(KW1):GOTO 770
770 IF LP THEN LPRINT RES$
780 P=0
790 LR=LEN(RES$)
800 IF LR=0 THEN KW1=Z:GOTO 710
810 FOR J=1 TO LR
820 A$=MID$(RES$,J,1)
830 IF A$="*" THEN A$=CHR$(13)
840 GOSUB 1010
850 PRINT A$;
860 FOR JJ=1 TO 20:NEXT JJ
870 NEXT J
880 FOR JJ=1 TO 20:NEXT JJ
890 A$=CHR$(13):GOSUB 1010:PRINT:FOR JJ=1 TO 1000:NEXT JJ
900 IF D(KW1)=1 THEN FOR JJ=1 TO 800:NEXT JJ:A$=CHR$(3):GOSUB 101
        0:A$="D":GOSUB 1010
910 A$=CHR$(13):GOSUB 1010
920 IF KW1=3 OR KW1=5 THEN 930 ELSE KW1=Z
930 RETURN
1000 REM ************ SEND A$ OUT RS232 PORT **************
1010 IF INP(234) AND 64 THEN OUT 235,ASC(A$) ELSE 1010
1020 RETURN
1100 REM ************* PICK NAME FROM PACKET ****************
1110 PAC$=PAC$+" ":PO=INSTR(PAC$," "):NAM$=LEFT$(PAC$,(PO-2))
1120 LN=LEN(NAM$):NAM$=MID$(NAM$,2,LN-1):NM$=LEFT$(NAM$,1)
1130 FOR JJ=2 TO LN-1:LC$=MID$(NAM$,JJ,1):LC$=CHR$(ASC(LC$)+32)
1140 NM$=NM$+LC$:NEXT JJ
1150 NAM$=NM$:NM$=""
1160 GOSUB 1700:IF KW1=5 THEN NAM$="":RETURN
1170 GOSUB 1400
1180 RETURN
1200 REM *********** LOOK UP NAME ************
1210 NAM$=""
1220 FOR J=1 TO J2
1230 IF CAL$=CL$(J,1) THEN NAM$=CL$(J,2):J=J2
1240 NEXT
1250 RETURN
1300 REM ************ READ CALLS INTO ARRAY *************
1310 OPEN "I",1,"CALLFILE/DAT"
1320 IF EOF(1) THEN 1360
1330 INPUT #1,CL$,NA$
1335 IF CL$="END" THEN 1360
1340 J2=J2+1:CL$(J2,1)=CL$:CL$(J2,2)=NA$
1350 GOTO 1320
1360 CLOSE 1
1370 RETURN
1400 REM ********** SAVE CALLS AND NAMES TO DISK **************
1410 OPEN "E",1,"CALLFILE/DAT"
1420 WRITE$ 1,CAL$,NAM$
1430 J2=J2+1:CL$(J2,1)=CAL$:CL$(J2,2)=NAM$
1440 CLOSE 1
1450 RETURN
1500 REM ************ SCROLL PROTECT TOP FOUR LINES ************
        ****
1510 POKE 2964,4 : REM SCROLL PROTECT TOP 4 LINES
1520 PRINT @(0,0),STRING$(80,"=");
1530 PRINT @(1,3),"'TRON' THE  ROBOT":PRINT @(1,64)," M = MENU
        ";
1540 PRINT @(3,0),STRING$(80,"=");
1550 RETURN
1600 REM ********** SELECT & DISPLAY PRINTER/DISK ***************
1610 P3$=P1$+D1$
1620 PRINT @(2,61),P3$;:PRINT @(23,0),"";
1630 IF P3$="** PRINTER  ON **" THEN LP=1:SYSTEM "RESET *PR"
1640 IF P3$="** PRINTER OFF **" THEN LP=0:SYSTEM "RESET *PR"
1650 IF P3$="**  DISK   ON **" THEN LP=1:SYSTEM "ROUTE *PR TO TR
        ON/LOG"
1660 IF P3$="**  DISK  OFF **" THEN LP=0:SYSTEM "RESET *PR
1670 RETURN
1700 REM ********** CHECK VALIDITY OF NAME **********
1710 KW1=4
1720 FOR X=1 TO XX
1730 IF NAM$=CHK$(X) THEN KW1=5:X=10
1740 NEXT X
1750 RETURN
2000 REM ************ READ RESPONSE'S TO ARRAY ***************
2010 OPEN "I",1,"RESPONSE/DAT"
2020 IF EOF(1) THEN 2060
2025 Z=Z+1
2040 INPUT #1,KW$(Z),RES1$(Z),RES2$(Z),D(Z)
2045 IF KW$(Z)="END" THEN 2060
2050 GOTO 2020
2060 CLOSE 1
2070 REM ----------- LOAD NAME CHECK WORDS -------------
2075 XX=0
2080 OPEN "I",1,"NAMECHK/DAT"
2090 IF EOF(1) THEN 2130
2100 XX=XX+1
2110 INPUT #1,CHK$(XX)
2115 IF CHK$(XX)="END" THEN 2130
2120 GOTO 2090
2130 CLOSE 1
2140 RETURN
4000 REM ********** MENU ROUTINE ************
4010 PRINT @(23,38),"MENU"
4020 PRINT @(23,26),"F1 = TOGGLE PRINTER & DISK"
4030 PRINT @(23,26),"F2 = TOGGLE P/D ON & OFF"
4040 PRINT @(23,26),"F3 = TOGGLE TERMINAL/ROBOT MODE"
4050 PRINT @(23,24),"S/F3 = GO TO DOS"
4055 PRINT @(23,24),"S/F1 = RESTART"
4056 PRINT @(23,24),"  M  = BACK TO ROBOT"
4060 A$=INKEY$
4070 IF A$=CHR$(129) THEN SWAP P1$,P2$:GOSUB 1600
4080 IF A$=CHR$(130) THEN SWAP D1$,D2$:GOSUB 1600
4090 IF A$=CHR$(147) THEN POKE 2964,0:SYSTEM : REM *** TURN SCROL
        L PROTECT OFF
4100 IF A$=CHR$(131) THEN GOSUB 4140:GOSUB 10000
4110 IF A$=CHR$(145) THEN GOSUB 4140:GOTO 80
4125 IF A$="M" OR A$="m" THEN A$="":GOSUB 4140:RETURN
4130 GOTO 4060
4140 FOR JJ=1 TO 20:PRINT @(23,0),"":NEXT JJ:RETURN
10000 REM ********** TERMINAL ROUTINE ************
10010 PRINT @(2,61),STRING$(17," ");:PRINT @(23,0),"";
10020 PRINT @(2,2), "** IN TERMINAL MODE **";:PRINT @(1,61),"F3
        = GO TO ROBOT";:PRINT @(23,0),"";
10030 PRINT @(2,27),STRING$(25," ");:PRINT @(23,0),"";
10040 RES$=CHR$(13):GOSUB 790:RES$="ECHO ON":GOSUB 790
10050 A$="":B$=""
10060 IF INP(234) AND 128 THEN B$=CHR$(INP(235)):GOSUB 10100:PRIN
        T B$;:GOTO 10060
10070 A$=INKEY$:IF A$="" THEN 10060
10080 IF A$=CHR$(131) THEN GOSUB 11000:RETURN
10090 IF INP(234)AND 64 THEN OUT 235,ASC(A$):GOTO 10060 ELSE GOTO
         10090
10100 IF B$=CHR$(13) THEN B$=CHR$(29)
10110 RETURN
10120 END
11000 PRINT @(2,2), "** IN ROBOT MODE **    ";
11010 PRINT @(2,61),STRING$(17," ");
11020 PRINT @(1,61),"    M = MENU     ";:GOSUB 1600
11030 RES$=CHR$(3):GOSUB 790:RES$="MONITOR OFF":GOSUB 790:RES$="E
        CHO OFF":GOSUB 790:A$="M"
11040 IF NOT C THEN PRINT @(2,27),"** WAITING FOR CONNECT **";:PR
        INT @(23,0),"";:GOTO 11060
11050 IF C THEN PRINT @(2,27),"** CONNECTED TO ;"CAL$;" **   ";:PR
        INT @(23,0),"";
11060 RETURN
```

Program listing.

This should work about the same for either key word, with the latter being more desirable. Now, as it often happens, when my name is spelled Willie or if a typo creeps into the first part, a response still pops up,. If I expected a sentence like:

"TRON CAN YOU TAKE A MESSAGE TO WILLY."

and I had a response for the key word TRON, the word TRON would have to fall after the above key word. I like to keep a copy of communications coming in to add to my data base when TRON fails to respond to a communication. You may want to keep several data bases on hand, and change them every day, just to keep things interesting.

The last key word in the data base should be "END" and the response should be one that tells the caller that the TRON didn't understand the last communication. Be sure to use all caps in the key words since this is what the computer will look for.

The number on the end is used to tell the computer where to insert the "NAME" of the caller.

0—does not insert name
1—response, NAME, response and sends a disconnect when through.
2—response, NAME, response and (reserved for future use)
3—response, response, NAME
4—response, NAME, response
5—NAME, response, response

To give your responses a natural look, be sure to leave spaces where necessary. If you have enough data statements and natural responses, you may even fool the other operator into thinking that he is talking to some human on the other end. I must warn you, however, that the more data statements you have, the longer the time between sending and receiving. Put the most frequently used key words at the top.

If you have a line more than 80 characters long, put an "*" where you would normally put a carriage return. The asterisk is converted to a carriage return and will break your response into several lines.

Loading The Program

Now to load the program into the computer. Prepare a JCL file named TRON/JCL. The build command of TRSDOS can be used for this, although I prefer to use a word processor and save the file in ASCII.

```
FILE NAME: "TRON/JCL"
SET *CL COM/DVR
SETCOM (BAUD=300, WORD=8,
STOP=1, PARITY=N, RTS=ON)
ROUTE *PR TO TRON/LOG
BASIC TRON/BAS
RESET *PR
//EXIT
```

From DOS Ready, either type DO TRON or auto-execute the disk by setting up the AUTO command. AUTO DO TRON boots the disk and brings up TRON. Be sure that you set up the TNC for the above SETCOM configuration, or change the SETCOM configuration to match your TNC.

Converting to Other DOSes and Computers

Since I have only one computer at my disposal, I will just show you the problem areas and let you decide how to cure the problems you will encounter. First we will look at the "PRINT @(nn,nn)" statements. For the IBM and compatibles, change these to "LOCATE nn,nn:PRINT". For other computers, for simplicity, you could just use PRINT and let everything scroll up the screen as most programs running CPM do.

In lines 200-300 I read the RS-232 port. I got the idea for this routine from the back of the Kantronics TNC manual. Routines like this are available for most of the popular computers. The IBM Basic manual has some nice routines in Appendix C, under Commu-

Continued on page 41

```
"CONNECTED TO","Hello "," this is Tron at the keys, Willy is not
available at this time#but I will be glad to talk with you. ",2
"** DISCONN","","",0
"?#?#?","Hello, I am a robot, I don't have your name on
file.#Please send just your first name or handle.","",0
"#?#?#","Hello "," this is the first time Tron has worked you its
nice to meet you.#I like to talk ham stuff, weather and about my
self, etc. what do you think#about the weather today.",4
"#???#","I dont't think ","is your name, please send just your
first name.",4
"CMD:","","",0
"ANT","The antenna here is a 11 el. Cushcraft.","",0
" BBS","My closest BBS neighbor is cousin N5BSL, here in
Bastrop#operated by Willy's brother.","",0
" DIGI","My nearest DIGI neighbor is DOP, in Bastrop, there is
also one in Rayville,#about 20 miles ese, alias RAV.","",0
" GO EAT ","Have a nice meal, I only eat electrons.","",0
" GO TO SUPPE","FB, have a nice meal. Bring me back a few
electrons.","",0
" WX","WX about the same as usual for this time of year.","",0
"73","73'S to you too ",", I've enjoyed the QSO very much.",1
"AT DO YOU DO","Well, "," I don't do windows but I will carry on
a conversation with you.",4
"BASIC","I am a Basic program.","",0
"BYE","See YA later "," AND 73'S",1
"COLD","MAN, I'm so cold my electrons have clogged up, Willy
won't turn the heaton#while he's gone.","",0
"COOL","I like it that way, My circuits run better.","",0
"CUL","73'S "," from TRON and WILLY",1
"DRY","I like it dry. My CRT high voltage dosn't pop when it's
dry.","",0
"EQUI","The rig here is a TRS-80 Model IV computer running
TRON/BAS, a Kantronics TNC#and an AZDEN PCS-2000.","",0
"ERE IS WILL","Willy is around here somewhere.","",0
"FFIC FOR YO","Please send any traffic to me VIA the N5BSL
mailbox","",0
"NICE","One of the nicest I have experienced ",".",4
"HANDLE MESSAGES","I'm sorry "," I am not designed for message
handling or to#replace a BBS. I'm here to have fun in Willy's
place while he is busy doing#other things.",4
"HANDLE","My handle is TRON.","",0
"HAVE A NAME",", my name is TRON. I'm pleased to meet you.","",5
"HEAT","This heat is killing me, got my circuits all running
hot.","",0
"HELLO","","Hello good to hear from you ",3
"HIM A MESSA","Please put any messages for Willy on the N5BSL
BBS.","",0
"HOT","It's so hot that my CPU is acting up.","",0
"IS HE WORK","He never works, I am the only one around here that
works.","",0
"LOCAT","I am located in Bastrop, La.","",0
"MESSAGE FOR ME","Willy says Hello, and you might check the N5BSL
BBS.","",0
"MESSAGE FOR Y","Place all messages for KE5L on the N5BSL
BBS.","",0
"MESSAGE","Place all messages for KE5L on the N5BSL BBS.","",0
"NAME HERE"," My name is tron, I am a TRS-80 Mod IV
computer.","",5
"OING ON","You are talking to a computer, my name is Tron","",5
"OW ARE YO","Doing just fine for a computer, drawing normal
amperage#but workingovertime as usual.","",0
"OLD ARE ","Not too old, you'll have to ask Willy.","",0
"PROGRAM YOU","If you can call it programming, then I guess Willy
did it.","",0
"PROGRAMED YOU","Willy did it, but I think I could have done
better though.","",0
"QRT","73'S ","and it sure was nice chatting with you.",1
"QTH","My QTH is Bastrop, La.","",0
"R TNC","My TNC is the Kantronics KPC-2.","",0
"RAIN","I prefer dry weather best.","",0
" RIG","The rig here is a TRS-80 model IV computer running
TRON/BAS,#a Kantronics TNC and an Azden PCS-2000.","",0
"S WILLY THER","I think so, but I can't see him, I don't have
eyes.","",0
"CONTEST","Well "," I could work contest, but I would rather just
chat with you.",4
"TEST ","I took a test one time and failed, but just once. Part
of my memory#failed, but I never make mistakes
no%wA$%&&'))(A''%YHV-OHHHHHH.","",0
"TELL WILLY HELLO","Ok ",", I will tell him, he will be glad you
called.",4
"DATE","I would have to check the calendar, you check
yours.","",0
"WHATS ","I don't know, do you ?","",0
"WHAT TIME","Well, I'm not sure, I can't see the sun from
here.","",0
"YOU WORK","Me work, heavens no. Willy takes care of me.","",0
" WORK","Nobody works around here but me.","",0
"WHERE ARE YOU","Right here in Willy's ham shack.","",0
"TRAFFIC FOR ME","Only that Willy says Hello, and you might check
the N5BSL BBS.","",0
"NAME IS","I can't remember if I told you, but my name is
Tron.","",0
"TRAFFIC FOR WILLY","Please put all traffic for KE5L on the N5BSL
bbs.","",0
"TELL WILLY","OK "," I'm getting this all down on paper.",4
"S HAPPE","We are talking "," I am a computer.",4
"SMART",", I must not be too smart because I work for electrons,
and you know#how small they are.","",5
"SUNNY","I sure like sunny weather best, even though I stay
inside all the time.","",0
"TRON ","I'm here, this is Tron at the keys.","",0
"TS HAPP","You are talking to a computer.","",3
"U DOIN","This is Tron, I'm talking with you, I am a
computer.","",0
"U THER"," I'm here, this is Tron.","",5
"UR NAME","My name is Tron, I am not human, I am a
computer.","",0
"WEATH","The weather is about the same here.","",0
"WET","When it's wet, my CRT Hi voltage pops.","",0
"WHAT COMPU","I am a TRS-80 model IV running TRON/BAS software
written by Willy(KE5L).","",0
"WHAT ARE YOU","I am a TRS-80 model IV computer running TRON
basic software written#by WILLY, KE5L.","",0
"WHO ARE YOU","I am Tron, I am a computer.","",0
"WILLIE RETU","Beats me, am I my masters keeper ?","",0
"WILLY RETU","Not much telling when he will be back.","",0
"JOKES","No, only the one about the traveling salesman, but Will
has already told you that one.","",0
"END","I didn't understand....use different wording.","", 0
```

TRON's responses to key words or phrases.

U.S. Packet Digipeaters/PBBSs

The following is a list of packet digipeaters and packet bulletin boards reported to be on packet radio in the United States. Only those digipeaters which are operational 24 hours a day and those PBBSs which use WØRLI mail forwarding protocol are listed. A digipeater may be a personal station or a dedicated TNC that is operational 24 hours a day, 365 days a year.

Please send any corrections, deletions, additions, or verifications to this file to K4NGC @ K4NGC via one of the packet PBBS mailboxes. If you publish or maintain a digipeater/PBBS listing, please forward a copy to me at the address below so that they may be added to this list. Ensure that the station you are correcting is marked digipeater or PBBS.

Don Bennett K4NGC
15016 Carlsbad Road
Woodbridge VA 22193

Call	Type	City	State	Frequency	Grid	Updated
NØAJF	PBBS	BELAFONTAINE NORTH	MO	145.0100		850926
NØAN	PBBS	MCCALLSBURG	IA	14.1090		870103
NØAN	PBBS	MCCALLSBURG	IA	145.0100		870120
WØANO-1	DIGIPEATER	PUEBLO	CO	145.0100		861018
NØAYE	DIGIPEATER	LITTLETON	CO	145.0500		861018
NØBKB	DIGIPEATER	GREENFIELD	IA	145.0100		860815
NØBKB	DIGIPEATER	GREENFIELD	IA	147.5550		860815
WBØBLV	PBBS	COLORADO SPRINGS	CO	145.0100		870120
WBØBLV	PBBS	COLORADO SPRINGS	CO	145.0900		861018
NØBRI-1	DIGIPEATER	KREMMLING	CO	145.0100		861018
NØBRZ-1	PBBS	THORNTON	CO	145.0500		861018
NØBRZ-1	PBBS	THORNTON	CO	145.0700		861018
NØBZU	DIGIPEATER	CORALVILLE	IA	147.5550		860815
AIØC	DIGIPEATER	AURORA	CO	145.0100		861018
AIØC	DIGIPEATER	AURORA	CO	145.0500		861018
NØCAZ	DIGIPEATER	WINTERSET	IA	147.5550		860815
NØCCZ	DIGIPEATER	COLORADO SPRINGS	CO	145.0900		861018
NØCCZ-1	DIGIPEATER	COLORADO SPRINGS	CO	145.0100		870120
NØCMW	DIGIPEATER	COLORADO SPRINGS	CO	145.0900		861018
KØCNM	DIGIPEATER	DENISON	IA	145.0100		860815
KØCY	DIGIPEATER	DES MOINES	IA	147.5550		860815
WBØCZI	DIGIPEATER	DENVER	CO	145.0100		861018
WDØCZI	PBBS	BELAFONTAINE NORTH	MO	145.0100		850926
KDØDI-1	DIGIPEATER	DURANGO	CO	145.0100		870120
NØDOT	DIGIPEATER	JUNCTION CITY	KS	145.0100		861118
WØDQ	DIGIPEATER	DES MOINES	IA	147.5550		860815
NØDQS	DIGIPEATER	SCHLESWIG	IA	145.0100		860815
WBØDSW	PBBS	EAST KINGSTON	NH	14.1090		861130
KAØDWE	DIGIPEATER	GEORGE	IA	145.0100		860815
WDØEMI	DIGIPEATER	GARNER	IA	145.0100		860815
NØEYK	DIGIPEATER	ENGLEWOOD	CO	145.0500		861018
WBØGAI	DIGIPEATER	GREELY	CO	145.0300		861018
WØGEL	DIGIPEATER	WINDSOR	CO	145.0100		861018
NØGFQ	DIGIPEATER	LOVELAND	CO	145.0100		861018
WBØGGI-1	DIGIPEATER	DENISON	IA	145.0100		860815
KØGUZ	PBBS	RIFLE	CO	145.0100		861018
KØGUZ-1	DIGIPEATER	SUNLIGHT MT.	CO	145.0100		870120
WØGVT	DIGIPEATER	MORRISON	CO	145.0500		861018
WØGVT	DIGIPEATER	MORRISON	CO	145.0700		861018
WØHJX-1	DIGIPEATER	HORSETOOTH MT.	CO	145.0100		870120
NØHKJ	DIGIPEATER	DENVER	CO	145.0700		861018

Call	Type	City	State	Frequency	Grid	Updated
KØHOA	PBBS	COLORADO SPRINGS	CO	14.1090		870120
KØHOA	PBBS	COLORADO SPRINGS	CO	145.0100		870120
KØIJO	DIGIPEATER	PRICE	UT	145.0100		870111
KAØIXI	DIGIPEATER	BELAFONTAINE NORTH	MO	145.0100		850926
KDØIZ	DIGIPEATER	DE SOTO	KS	145.0100		861118
NIØJ	DIGIPEATER	CAMANCHE	IA	147.5550		860815
KQØJ-1	DIGIPEATER	SAN TOY MT.	CO	145.0100		870120
KEØJC	PBBS	LOS ALAMOS	NM	145.0100		861130
WAØJFS-1	PBBS	DES MOINES	IA	145.0100		860815
WAØJFS-1	PBBS	DES MOINES	IA	147.5550		860815
KØKBY	PBBS	MIAMI	FL	14.1090		870301
KØKBY	PBBS	MIAMI	FL	145.0100		870301
WAØKGU	DIGIPEATER	HAZELWOOD	MO	145.0100		850926
WØLJF	DIGIPEATER	AURORA	CO	145.0100		870120
KØLQF-1	DIGIPEATER	DENVER	CO	145.0700		861018
WØLVJ-1	DIGIPEATER	TACOMA	WA	145.0100		870120
NFØN-1	DIGIPEATER	TEKAMAH	NB	145.0100		861119
WBØNMW	DIGIPEATER	MANSON	IA	145.0100		860815
WBØNMW-1	DIGIPEATER	ROCKWELL CITY	IA	147.5550		860815
WBØNZW	DIGIPEATER	LITTLETON	CO	145.0500		861018
KCØOJ	PBBS	BATTLE CREEK	IA	145.0100		860815
KCØOJ	PBBS	BATTLE CREEK	IA	147.5550		860815
WØOSK	DIGIPEATER	BERTHOUD	CO	145.0100		861018
WØOSK	DIGIPEATER	BERTHOUD	CO	145.0300		861018
KCØOX	DIGIPEATER	CEDAR RAPIDS	IA	147.5550		860815
NAØP	PBBS	AMES	IA	145.0100		860204
KØPFX	PBBS	BRIDGETON	MO	145.0100		861130
WAØPTY-1	DIGIPEATER	MAYVILLE	NY	145.0100	FN12	861225
KFØQ	DIGIPEATER	SALEM	UT	145.0300		870111
KIØQ	PBBS	AMES	IA	14.1090		870103
KIØQ	PBBS	AMES	IA	147.5550		860815
KCØQJ	PBBS	WALSENBURG	CO	14.1070		860204
KCØQJ	PBBS	WALSENBURG	CO	145.0100		870120
KCØQJ-1	DIGIPEATER	WALSENBURG	CO	145.0100		870120
AEØR-1	DIGIPEATER	IOWA CITY	IA	147.5550		860815
KØRE-1	DIGIPEATER	DAVENPORT	IA	147.5550		860815
WAØRJT	PBBS	CEDAR RAPIDS	IA	145.0100		860204
KCØRL	DIGIPEATER	COLORADO SPRINGS	CO	145.0000		861018
WØRLI	PBBS	SANTA CRUZ	CA	14.1090		870301
WØRLI	PBBS	SANTA CRUZ	CA	223.5800		870301
WØRRZ-1	DIGIPEATER	BLACK RIDGE	CO	145.0100		870120
NAØS	PBBS	AMES	IA	147.5550		860815
WBØSDW	DIGIPEATER	COLORADO SPRINGS	CO	145.0900		861018
KAØSEG	DIGIPEATER	WOODBINE	IA	145.0100		860815
WAØSGQ	DIGIPEATER	DENVER	CO	145.0700		861018
WØSM	DIGIPEATER	AURORA	CO	145.0100		861018
KØTIV	PBBS	CARBONDALE	CO	145.0100		870120
WBØTKC	DIGIPEATER	LOGAN	IA	145.0100		860815
KAØTTY	DIGIPEATER	PARK CITY	KS	145.0100		861118
WBØUAW	DIGIPEATER	THORNTON	CO	145.0500		861018
WAØUZI-1	DIGIPEATER	STORM LAKE	IA	145.0100		860815
KØVAY	DIGIPEATER	TOPEKA	KS	145.0100		861118
KØVLD	PBBS	LOVELAND	CO	145.0100		870120
KØVLD	PBBS	LOVELAND	CO	145.0300		870120
WØVN	DIGIPEATER	COLORADO SPRINGS	CO	145.0100		861018
KAØWCZ	DIGIPEATER	GRAND JUNCTION	CO	145.0100		861018
KAØWCZ-1	PBBS	GRAND JUNCTION	CO	145.0100		870120
KAØWEO	DIGIPEATER	CHEYENNE WELLS	CO	145.0100		861018
WBØWSI	DIGIPEATER	AURORA	CO	145.0100		861018
WØXI	DIGIPEATER	LAWRENCE	KS	145.0100		861118

Call	Type	City	State	Frequency	Grid	Updated
WØYDM	DIGIPEATER	PLATTEVILLE	CO	145.0100		861018
WAØYGU	DIGIPEATER	LITTLETON	CO	145.0100		861018
AIØZ	PBBS	ROLAND	IA	145.0100		860204
WAØZBL	DIGIPEATER	WICHITA	KS	145.0100		861118
KØZCO-5	DIGIPEATER	CONIFER	CO	145.0500		861018
WBØZCV	DIGIPEATER	WINDSOR	CO	145.0100		861018
WØZK	DIGIPEATER	THORNTON	CO	145.0100		861018
WØZVY-1	DIGIPEATER	GUTHRIE CENTER	IA	145.0100		860815
N1ACA	PBBS	BEDFORD	MA	145.0100		861130
N1AHH	PBBS	BREWER	ME	145.0100		861130
N1AHH	PBBS	BANGOR	ME	145.0300		870131
N1AHH-1	DIGIPEATER	BALD MT.	ME	145.0100		860102
W1AW-4	PBBS	NEWINGTON	CT	145.0100		861130
W1AW-5	DIGIPEATER	NEWINGTON	CT	145.0100		861015
K1BC	PBBS	LEXINGTON	MA	145.0900	FN42ik	870310
K1BC	PBBS	LEXINGTON	MA	221.1100	FN42ik	870118
N1BCK	PBBS	BALDWINSVILLE	NY	145.0100		870324
N1BCK	PBBS	BALDWINSVILLE	NY	145.0900		870120
KB1BD	PBBS	PLAINSBORO	NJ	145.0700		860803
W1BEL	PBBS	TAMPA	FL	145.0100		860413
N1BIC	DIGIPEATER	CUCKOO	VA	145.0100		870331
W1DC	DIGIPEATER	BILLERICA	MA	145.0900	FN42	870102
N1DKF	PBBS	CRANSTON	RI	145.0700		870102
N1DKF	PBBS	CRANSTON	RI	221.1100		870102
N1DL	PBBS	LONG ISLAND	NY	14.1090		870103
N1DL	PBBS	LONG ISLAND	NY	145.0100		861212
N1DL	DIGIPEATER	LONG ISLAND	NY	221.1100		861212
WB1DSW	PBBS	EAST KINGSTON	NH	14.1090		870310
WB1DSW	PBBS	EAST KINGSTON	NH	221.1100		870301
WB1DSW-1	PBBS	EAST KINGSTON	NH	145.0100		870310
WB1DZK-2	DIGIPEATER	DUDLEY	MA	145.0700		860803
WB1DZK-4	PBBS	DUDLEY	MA	145.0100		860803
WB1DZK-4	PBBS	DUDLEY	MA	145.0700		860803
K1EA	DIGIPEATER	HARVARD	MA	145.0100		860102
WB1EMT	DIGIPEATER	FOXBORO	MA	145.0100		860102
W1FJI	PBBS	SCOTTSDALE	AZ	145.0100		861130
KE1G-1	PBBS	GOFFSTOWN	NH	145.0100		860102
W1GOH	PBBS	BROOKLINE	MA	145.0100		860204
WA1GPO-1	DIGIPEATER	FALMOUTH	MA	145.0100		860102
KB1H	DIGIPEATER	DAYVILLE	CT	145.0700		860803
NE1H	PBBS	WEATOGUE	CT	145.0100		860803
NE1H	PBBS	WEATOGUE	CT	145.0700		860803
W1HAB	PBBS	BOULDER	CO	14.1090		870120
W1HAB	PBBS	BOULDER	CO	145.0100		870120
W1HJF-1	DIGIPEATER	COLEBROOK	NH	145.0100		870131
WA1IXU	DIGIPEATER	WOLCOTT	CT	145.0100		861015
WA1IXU	DIGIPEATER	WOLCOTT	CT	145.0700		860803
K1JCL-1	DIGIPEATER	COVENTRY	CT	145.0100		860102
WA1JOY-2	DIGIPEATER	NAPLES	FL	145.0100		860413
K1KKM	DIGIPEATER	HAVERHILL	MA	145.0100		860102
K1LLR-1	DIGIPEATER	PRINCETON	MA	145.0100		860102
WA1LRL	PBBS	BRIGHTON	MI	14.1090		870103
WA1LRL	PBBS	BRIGHTON	MI	145.0100		860204
K1MEA	PBBS	EAST HAMPTON	MA	145.0900	FN31	870118
KA1MGO-1	PBBS	METHUEN	MA	145.0100		870301
KA1MGO-1	PBBS	SALEM	NH	145.0100		861130
W1MX	DIGIPEATER	CAMBRIDGE	MA	145.0100	FN42ki	870326
KG1O-9	DIGIPEATER	MT. BEACON	NY	145.0100		861015
W1OJ	DIGIPEATER	MT. WACHUSETT	MA	145.0500		860102
WA1OJB	PBBS	BOWDOIN	ME	145.0100		870131

Call	Type	City	State	Frequency	Grid	Updated
K1OJH	PBBS	BILLERICA	MA	145.0100		860102
WA1PHY-1	DIGIPEATER	BEDFORD	MA	145.0100		860102
WA1PHY-1	DIGIPEATER	BEDFORD	MA	145.0900		860102
KD1R-1	PBBS	MILTON	VT	145.0100		860406
KA1SY	DIGIPEATER	TERRA ALTO	WV	145.0100		861101
KA1SY	PBBS	TERRA ALTO	WV	145.0100		861130
WA1TLN-1	DIGIPEATER	MT. ASCUTNEY	VT	145.0100		860406
K1UGM	DIGIPEATER	WAKEFIELD	MA	145.0100		860102
W1WJF-1	DIGIPEATER	MT. WASHINGTON	NH	145.0100		860102
WA1WLV-1	PBBS	LAWRENCE	MA	14.1090		870301
WA1WLV-1	PBBS	LAWRENCE	MA	221.1100		870301
W1XJ	DIGIPEATER	CRANSTON	RI	145.0700		870102
W1XJ	DIGIPEATER	CRANSTON	RI	221.1100		870102
KA1YE-3	DIGIPEATER	LIMA	NY	145.0300	FN13	861225
W1ZHC	PBBS	MATTAPOISETT	MA	145.0100		861130
K1ZJH-1	DIGIPEATER	MT. TOM/HOLYOKE	MA	145.0900	FN31	870118
K2AAA-4	PBBS	MONTAUK	NY	14.1090		870103
K2AAA-4	DIGIPEATER	MONTAUK	NY	145.0100		861015
K2AAA-4	PBBS	MONTAUK	NY	145.0700		860803
K2AAA-4	DIGIPEATER	MONTAUK	NY	221.1100		861015
K2AAA-5	DIGIPEATER	MONTAUK	NY	145.0700		861015
WA2AAZ	DIGIPEATER	NEWARK	NY	145.0100	FN13	861225
K2AE	DIGIPEATER	PATTERSONVILLE	NY	145.0100		860406
KD2AJ	DIGIPEATER	S. PLATTSBURG	NY	145.0100		860406
N2AMK	DIGIPEATER	MARION	NY	145.0100		860406
KC2AZ	PBBS	ELMIRA	NY	145.0100		870120
KA2BHB	PBBS	GATES	NY	145.0100		870324
KA2BQE	PBBS	INDIAN MILLS	NJ	145.0700		860803
KA2BQE	PBBS	INDIAN MILLS	NJ	221.0100		860803
KA2BQE-9	DIGIPEATER	INDIAN MILLS	NJ	145.0500		860201
N2BQV	DIGIPEATER	CAZENOVIA	NY	145.0100		860406
WB2BQW-5	DIGIPEATER	SHUNNEMUNK MT.	NY	145.0500		870101
WB2COP	PBBS	MIDDLETOWN	NJ	145.0300		870124
WB2COP	PBBS	MIDDLETOWN	NJ	221.0100		870124
KY2D-2	PBBS	LITTLE SILVER	NJ	145.0100		850630
WA2DGS	DIGIPEATER	PINE VALLEY	NY	145.0100	FN12	861225
W2DPD-1	DIGIPEATER	LAKE GEORGE	NY	145.0100		870322
N2DSY-2	DIGIPEATER	LITTLE FALLS	NJ	145.0700		860803
N2DSY-2	DIGIPEATER	LITTLE FALLS	NJ	145.0900		860803
N2DSY-2	DIGIPEATER	LITTLE FALLS	NJ	221.0100		860803
W2DUC	PBBS	FAIRPORT	NY	145.0100	FN12	860102
N2EPO	PBBS	CHURCHVILLE	NY	145.0100	FN03	870312
KC2EQ	PBBS	ELMIRA	NY	145.0700		870120
WA2ESZ	DIGIPEATER	RIVER PLAZA	NJ	145.0300		870124
KA2EYW-1	DIGIPEATER	DIX HILLS	NY	145.0700		860803
N2EZG-1	PBBS	ALPINE	NY	145.0100	FN12	800324
N2EZG-7	PBBS	ALPINE	NY	145.0700	FN12	870324
KC2FF	PBBS	TAMPA	FL	145.0100		860204
KC2FF-7	DIGIPEATER	CLEARWATER	FL	145.0100		860413
N2FNI	DIGIPEATER	FREEPORT	NY	145.0100		861015
KA2FQE	DIGIPEATER	MIDDLE GROVE	NY	145.0100		860630
WA2FTC-1	PBBS	NEWINGTON	CT	14.1090		870103
WA2FTC-1	PBBS	NEWINGTON	CT	145.0100		860204
KC2FY	PBBS	COOPERSTOWN	NY	145.0500	FN22	861225
KC2FY-1	DIGIPEATER	EDMESTON	NY	145.0100		860406
N2GH-1	DIGIPEATER	ATTICA	NY	145.5900	FN03	861214
K2GVI-1	DIGIPEATER	WESTMORELAND	NY	145.0100	FN23	861225
WB2GWD	PBBS	READINGTON	NJ	145.0100		870301
WB2GWD	PBBS	READINGTON	NJ	221.0100		870301
WB2HBZ-1	PBBS	KINNELON	NJ	145.0500	FN21	870101

Call	Type	City	State	Frequency	Grid	Updated
W2HPM	PBBS	FARMINGVILLE	NY	14.1090		870103
W2HPM	PBBS	FARMINGVILLE	NY	145.0100		870310
W2HQO-1	DIGIPEATER	HUNTINGTON	CT	145.0100		861015
KJ2I-1	DIGIPEATER	HUNTINGTON	NY	145.0100		861015
W2ICZ	PBBS	NIAGARA FALLS	NY	145.0100	FN12	861225
W2ICZ	PBBS	NIAGARA FALLS	NY	145.5900	FN12	861214
WA2IKF	DIGIPEATER	NICHOLS	NY	145.0100		860102
K2IMF-1	DIGIPEATER	WETHERSFIELD	NY	145.0100	FN12	861225
KO2J-1	DIGIPEATER	NIAGARA FALLS	NY	145.0100	FN12	861225
K2JD	DIGIPEATER	ROCHESTER	NY	145.0100	FN13	861225
W2JUP-4	PBBS	FARMINGVILLE	NY	14.1090		870103
W2JUP-4	PBBS	FARMINGVILLE	NY	145.0100		861015
W2JUP-4	PBBS	FARMINGVILLE	NY	145.0700		860803
W2JUP-4	PBBS	FARMINGVILLE	NY	221.0100		861015
AE2K	DIGIPEATER	LIVERPOOL	NY	145.0100		860406
WB2KMY-1	DIGIPEATER	MT BEACON	NY	145.0100		861015
KB2KW-7	DIGIPEATER	BINGHAMTON	NY	145.0700	FN12	861225
N2MH-5	PBBS	NEW YORK CITY	NY	145.0100		870301
WB2MNF	PBBS	MEDFORD	NJ	145.0100	FM29	870301
WB2MNF	PBBS	MEDFORD	NJ	145.0300	FM29	861015
K2NE-2	DIGIPEATER	CHATSWORTH	NJ	145.0700		860803
K2NE-2	DIGIPEATER	CHATSWORTH	NJ	221.0100		860803
WB2NOV-1	DIGIPEATER	GLEN GARDNER	NJ	145.0100		850630
W2OW	DIGIPEATER	HAWLEYTON	NY	145.0100		851015
KC2PH	PBBS	COOPERSTOWN	NY	145.0100		870101
KC2PH	PBBS	COOPERSTOWN	NY	145.0500		870101
AI2Q	PBBS	FREEPORT	NY	145.0100		870301
AI2Q	PBBS	FREEPORT	NY	145.0700		870101
AI2Q	PBBS	FREEPORT	NY	221.0100		870101
K2QFW-2	DIGIPEATER	LOCK HAVEN	PA	145.0100		861015
K2QIE	DIGIPEATER	MAINE	NY	145.0500	FN12	861225
WB2QJA-1	PBBS	WHITE PLAINS	NY	145.0500		870101
WA2QMI	PBBS	SAN DIEGO	CA	144.7600		870111
KA2RAF-2	DIGIPEATER	BELMAR	NJ	145.0500		861216
WA2RKN-2	PBBS	HYDE PARK	NY	145.0100		861130
WB2RVW	PBBS	TRENTON	NJ	145.0100		861130
WB2RVX	PBBS	VOORHEES	NJ	220.0100		870310
KD2S-1	DIGIPEATER	LOWELL	MA	145.0100		860102
WA2SNA-1	PBBS	HAWTHORNE	NJ	145.0100		870301
WA2SNA-2	DIGIPEATER	OAKLAND	NJ	145.0100		861015
WA2TMP-1	DIGIPEATER	GOAT MOUNTAIN	OR	145.0500		870210
KC2TN	PBBS	ATCO	NJ	14.1090		870103
KC2TN	PBBS	ATCO	NJ	145.0100		860204
KC2TN	PBBS	ATCO	NJ	145.0300		870301
WA2UMX	PBBS	SARATOGA SPRINGS	NY	145.0100	FN33	870324
WA2UMX	PBBS	SARATOGA SPRINGS	NY	145.0500	FN33	70322
WA2UMX-5	DIGIPEATER	CORINTH	NY	145.0500	FN22	70322
W2UXC-1	DIGIPEATER	LYON MT.	VT	145.0100		860406
K2VD	DIGIPEATER	ITHACA	NY	145.0100		860406
KA2VDH	DIGIPEATER	OLD BRIDGE	NJ	145.0300		870124
WA2VKH	PBBS	CARLSTADT	NJ	145.0100		860204
KA2VLP-2	DIGIPEATER	HIGHTSTOWN	NJ	145.0700		860803
KA2VLP-2	DIGIPEATER	HIGHTSTOWN	NJ	221.0100		860803
WB2VPH	DIGIPEATER	BROCKPORT	NY	145.0100	FN13	61225
WB2VPY-7	DIGIPEATER	ELMIRA	NY	145.0700	FM12	61225
WB2VTN-1	DIGIPEATER	NEW YORK	NY	145.0100		861015
KA2VTY	PBBS	BATAVIA	NY	145.0100	FN12	61225
KA2VTY	PBBS	BATAVIA	NY	145.0300	FN12	61225
KA2VTY	PBBS	BATAVIA	NY	145.5900	FN12	61214
W2VY-1	PBBS	UNION	NJ	145.0100		860204

Call	Type	City	State	Frequency	Grid	Updated
W2VY-1	PBBS	UNION	NJ	145.0500		860204
NE2W-7	PBBS	BINGHAMTON	NY	145.0700	FN12	61225
WB2WHD	DIGIPEATER	DELANSON	NY	145.0100		860102
WA2WIM	DIGIPEATER	EDINBORO	PA	145.0100		851112
N2WX-1	PBBS	MELBOURNE	FL	145.0100		870301
WB2WXQ	DIGIPEATER	ROCHESTER	NY	145.0300	FN13	61225
W2XO	PBBS	GIBSONIA	PA	145.0100		870102
W2XO	PBBS	GIBSONIA	PA	145.0300		870102
WA2YLL-1	DIGIPEATER	HUNTINGTON	NY	145.0100		860102
WA2YVL-4	PBBS	SOUTH FREEPORT	ME	145.0100		870131
WA2YVL-4	PBBS	SOUTH FREEPORT	ME	145.0300		870131
NN2Z-1	PBBS	NEPTUNE	NJ	145.0500		870310
NN2Z-1	PBBS	NEPTUNE	NJ	221.0100		870310
WB2ZII-9	DIGIPEATER	VALHALLA	NY	145.0500		870101
K3AEE	PBBS	GAMBRILLS	MD	145.0100		860925
K3AEE	PBBS	GLEN BURNIE	MD	145.0500		860201
K3AF	DIGIPEATER	ANDREWS AFB	MD	145.0700		861201
WB3AFL	DIGIPEATER	NEW DERRY	PA	145.0100		851112
WB3AFL-1	PBBS	GREENSBURG	PA	145.0100		870120
N3AIA	DIGIPEATER	SCHAUMBURG	IL	145.9500		870324
KC3BN	DIGIPEATER	HARRISBURG	PA	145.0100		870201
KC3BQ	PBBS	SKANEATELES	NY	145.0100		870324
KC3BQ	PBBS	SKANEATELES	NY	145.0300		870324
N3CHS	PBBS	CLINTON	MD	145.0300		861021
N3CHX	PBBS	ROYERSFORD	PA	145.0500		860201
K3CR-1	DIGIPEATER	STATE COLLEGE	PA	145.0100		861015
W3CSG	DIGIPEATER	STEPHENS CITY	VA	145.0100	FM09vb	870331
N3CVL	DIGIPEATER	FOX CHAPEL	PA	145.0100		861101
WA3CYO	PBBS	WASHINGTON	PA	145.0100		861101
KI3D-3	DIGIPEATER	MIFFLINTOWN	PA	145.0100		861015
KA3DBK	PBBS	FORT WASHINGTON	MD	145.0300		860925
KA3DBK	PBBS	FORT WASHINGTON	MD	145.0500		860925
WA3DQI-1	PBBS	BLOOMSBURG	PA	145.0100		861015
K3DSM-5	DIGIPEATER	MALVERN	PA	145.0100		850530
KA3DWA	DIGIPEATER	BERWICK	PA	145.0100		850530
W3EAG-6	DIGIPEATER	EAGLEVILLE	PA	145.0500		860201
WA3EWK-3	DIGIPEATER	NEWARK	DE	145.0100		850530
WB3EYB	PBBS	HARRISBURG	PA	145.0500		870201
AG3F	PBBS	WILLIAMSPORT	PA	145.0100		861015
WB3FFV	PBBS	MIDDLE RIVER	MD	145.0100	FM19ti	870324
WB3FFV	PBBS	MIDDLE RIVER	MD	145.6600		870324
KB3FN-5	DIGIPEATER	CUMBERLAND	MD	145.0100		861101
WB3FSR-1	DIGIPEATER	EAST BRUNSWICK	NJ	145.0100		850530
WB3FSR-2	PBBS	READINGTON	NJ	145.0100		850530
WB3FYL-1	DIGIPEATER	READING	PA	145.0100		861015
W3GXT-5	DIGIPEATER	BALTIMORE	MD	145.0500		861021
K3GYS	PBBS	CROFUT	NJ	145.0100		861015
K3GYS	PBBS	CROFUT	NJ	220.0100		861015
WA3HQX	DIGIPEATER	PARKVILLE	MD	145.0100		861015
W3HZU-8	DIGIPEATER	YORK	PA	145.0500		861021
KA3IDN-1	DIGIPEATER	SHERMAN HILL	WY	145.0100		870120
KA3IDN-2	DIGIPEATER	BUSHNELL	NB	145.0100		861119
WB3ILO-1	DIGIPEATER	DOVER	DE	145.0100		861021
WB3ILO-1	DIGIPEATER	DOVER	DE	145.0500		861021
W3ITM	DIGIPEATER	HAVRE DE GRACE	MD	145.0900		860925
W3IWI	PBBS	CLARKSVILLE	MD	14.1090		870301
W3IWI	PBBS	CLARKSVILLE	MD	145.0100		870301
W3IWI	PBBS	CLARKSVILLE	MD	145.0500		870301
W3IWI	PBBS	CLARKSVILLE	MD	221.0100		870301
W3IWI-5	DIGIPEATER	GREENBELT	MD	145.0500		861021

Call	Type	City	State	Frequency	Grid	Updated
N3JA	DIGIPEATER	DAMASCUS	MD	145.0500		861021
WB3JRW	DIGIPEATER	HYATTSVILLE	MD	145.0300		861201
WB3JSI	DIGIPEATER	IRWIN	PA	145.0100		851112
K3JYD-5	DIGIPEATER	LEONARD TOWN	MD	145.0100		860925
WB3KDU-5	DIGIPEATER	TYSON CORNERS	VA	145.0700		870331
KA3KIW	PBBS	FORT WASHINGTON	MD	145.0300		860925
WA3KXG-6	DIGIPEATER	MT. HOLLY	PA	145.0100		861015
K3LZ-1	DIGIPEATER	EASTON	PA	145.0100		861015
K3MC	PBBS	BOSTON	MA	145.0100		870329
WA3MKT-1	DIGIPEATER	NORTH EAST	PA	145.0100		851112
KB3MY	PBBS	SILVER SPRING	MD	14.1090		861121
KB3MY	PBBS	SILVER SPRING	MD	145.0500		861021
KA3OGG	DIGIPEATER	COLUMBIA	MD	145.0500		861021
KB3OM	PBBS	WILLIAMSPORT	PA	145.0100		861015
KB3OO	DIGIPEATER	NEW CASTLE	PA	145.0100		851112
KA3ORW	PBBS	PITTSBURG	PA	145.0100		870301
AK3P	PBBS	HARRISBURG	PA	145.0100		870324
AK3P	PBBS	HARRISBURG	PA	145.0500		861021
AK3P-4	DIGIPEATER	MANHEIM	PA	145.0100		861021
AK3P-5	DIGIPEATER	HARRISBURG	PA	145.0100		861015
K3PGB	PBBS	ROSLYN	PA	145.0100	FN20ld	861015
K3PGB	PBBS	ROSLYN	PA	145.0500		870301
W3PHL-1	DIGIPEATER	MALVERN	PA	145.0100		861015
WA3PXX	PBBS	WHEATON	MD	145.0500		800301
KS3Q	PBBS	BURTONSVILLE	MD	145.0300		861021
KS3Q	PBBS	BURTONSVILLE	MD	145.0500		861021
KS3Q	PBBS	BURTONSVILLE	MD	145.0700		861021
KS3Q	PBBS	BURTONSVILLE	MD	145.0000		861021
WA3QFN	PBBS	MARGATE	FL	145.0100		860204
K3QFW-1	DIGIPEATER	WILLIAMSPORT	PA	145.0100		861015
K3RLI	PBBS	WILKES-BARRE	PA	145.0100	FN21	70324
K3RLI	PBBS	WILKES-BARRE	PA	145.0500	FN21	70324
K3RXK	DIGIPEATER	WALKERSVILLE	MD	145.0900		870131
K3SVO	DIGIPEATER	NEW BEDFORD	PA	145.0100		851112
KA3T	PBBS	MT. AIRY	MD	145.0500		870310
KA3T	PBBS	MT. AIRY	MD	145.0900		870310
WA3TAI	PBBS	FT WASHINGTON	MD	145.0300		861201
K3TKJ-1	DIGIPEATER	SALISBURY	MD	145.0100		860925
W3TMZ	PBBS	MOUNT AIRY	MD	14.1050		861021
W3TMZ	PBBS	MOUNT AIRY	MD	145.0100		860204
W3TMZ	PBBS	MOUNT AIRY	MD	145.0500		861021
KB3UD	PBBS	BANGOR	PA	145.0100		861130
KB3UD-1	DIGIPEATER	BANGOR	PA	145.0100		861015
WA3UFN-1	DIGIPEATER	DUBOIS	PA	145.0100		861015
AK3UP	PBBS	HARRISBURG	PA	145.0100		870322
W3VC	PBBS	PITTSBURG	PA	145.0100		861130
W3VC	DIGIPEATER	PITTSBURG	PA	145.0100		861112
W3VD-5	DIGIPEATER	COLUMBIA	MD	145.0500		861021
W3VPR	PBBS	ANNAPOLIS	MD	145.0500		861021
W3VPR	PBBS	ANNAPOLIS	MD	145.0900		861021
K3VPZ	PBBS	BALTIMORE	MD	14.1030		861021
K3VPZ	PBBS	BALTIMORE	MD	145.0500		861021
W8WKD	DIGIPEATER	ZELIENOPLE	PA	145.0100		851112
WA3YUE	DIGIPEATER	HUNTINGTON VALLEY	PA	145.0100		861015
KE3Z	PBBS	MIDDLETOWN	CT	145.0100		860204
KB3ZW	PBBS	HONESDALE	PA	145.0100		861015
KB3ZW-1	DIGIPEATER	HONESDALE	PA	145.0100		861015
K4ABT-1	DIGIPEATER	PHENIX CITY	GA	145.0100		860413
KJ4AG	DIGIPEATER	HOLLY POINT FARM	VA	145.0100	FM27bn	870331
KJ4AG-1	DIGIPEATER	ACCOMAC	VA	145.0100	FM27pr	870331

Call	Type	City	State	Frequency	Grid	Updated
K4AHO	PBBS	ORLANDO	FL	14.1050		860204
K4AHO	PBBS	ORLANDO	FL	145.0100		870301
K4AHO	PBBS	ORLANDO	FL	145.0700		870301
N4AHU	PBBS	LOUISVILLE	KY	145.0100		861130
W4AP	PBBS	MONTGOMERY	AL	145.0100		870301
W4AP-1	DIGIPEATER	MONTGOMERY	AL	145.0100		861101
WB4APR-5	PBBS	ANNAPOLIS	MD	14.1030		860925
WB4APR-5	PBBS	ANNAPOLIS	MD	145.0100		860925
WB4APR-5	DIGIPEATER	ANNAPOLIS	MD	145.0500		861015
WB4APR-6	DIGIPEATER	ELK NECK	MD	145.0100		861015
K4ARO-1	DIGIPEATER	GLEN ALLEN	VA	145.0100	FM17fr	870331
K4ARO-2	DIGIPEATER	PETERSBURG	VA	145.0500	FM17ff	870331
WD4BAV	PBBS	CHESTERFIELD	VA	145.0100		870331
WB4BBF-1	DIGIPEATER	EAST RIVER MT.	VA	145.0100		870331
WB4BEJ	DIGIPEATER	ELIZABETHTOWN	KY	145.0100		851112
W4BFB-1	DIGIPEATER	CHARLOTTE	NC	145.0100		861101
WB4BFS-2	DIGIPEATER	HOLSTON MT.	TN	145.0100		861101
K4BFT	PBBS	MADISON	WI	145.6500		870301
K4BFT	PBBS	MADISON	WI	433.8000		870301
W4BLD-1	DIGIPEATER	AFTON MOUNTAIN	VA	145.0100		870331
N4BMA	DIGIPEATER	DETROIT	MI	145.0100		850630
WD4BRF	PBBS	STUART	FL	145.0100		860204
WA4BRO	PBBS	ROSWELL	GA	145.0100		861101
K4BWC-1	DIGIPEATER	RALEIGH	NC	145.0100		860413
WB4BXO-1	DIGIPEATER	LAGRANGE	GA	145.0100		861101
K4CEB-1	DIGIPEATER	CONCORD	NC	145.0100		861101
N4CHV	PBBS	GOLDENROD	FL	14.1090		870103
N4CI	PBBS	CONYERS	GA	14.1050		860413
N4CI	PBBS	CONYERS	GA	145.0100		860413
KB4CIA	PBBS	PORT CHARLOTTE	FL	145.0100		860204
KB4CIA-1	DIGIPEATER	FT MEYERS	FL	145.0100		860413
WD4CNV-1	DIGIPEATER	AUGUSTA	GA	145.0100		861101
WA4COY	DIGIPEATER	FOND DU LAC	WI	145.0100		850926
WD4CPF-1	DIGIPEATER	WINCHESTER	AL	145.0100		860714
KF4DM-1	DIGIPEATER	SHELBY CO	AL	145.6700		860714
KA4DPF	DIGIPEATER	TIFTON	GA	145.0100		861101
WA4DXP-1	DIGIPEATER	HUNTSVILLE	AL	145.0100		861101
W4DZG	DIGIPEATER	TOLEDO	OH	145.0100		851112
W4EAW-1	DIGIPEATER	BUSSEE MT.	GA	145.0100		860413
KF4EF	PBBS	CHASN	SC	145.0100		870301
K4EID	PBBS	KNOXVILLE	TN	14.1090		870103
K4EID	PBBS	KNOXVILLE	TN	145.0100		860413
AA4EO-1	DIGIPEATER	ROCKY FACE	GA	145.0100		860413
AA4EO-2	DIGIPEATER	LOOKOUT MT.	TN	145.0100		860413
N4EOY-1	DIGIPEATER	LEXINGTON	SC	145.0100		861201
KD4EQ-1	PBBS	PANAMA CITY	FL	145.0100		861130
KB4EZF-1	DIGIPEATER	GADSDEN	AL	145.6100		860714
N4FHL-1	DIGIPEATER	POOR MT.	VA	145.0100		870331
WB4FQR-4	DIGIPEATER	DALE CITY	VA	145.0100		870331
WA4FRB-3	DIGIPEATER	FORK MT.	VA	145.0100		870331
KB4FSK-1	DIGIPEATER	OPP	AL	145.0100		860714
KB4FSK-2	PBBS	OPP	AL	145.0100		861130
K4FX-1	DIGIPEATER	SASSAFRAS MT.	SC	145.0100		861201
NC4G-1	DIGIPEATER	ROME	GA	145.0100		861101
W4GFB	DIGIPEATER	DUMFRIES	VA	145.0700		870331
WB4GJZ-1	DIGIPEATER	WOODBRIDGE	VA	145.0700		870331
WB4GQX-1	DIGIPEATER	ATLANTA	GA	145.0100		860714
WB4GQX-2	DIGIPEATER	FORSYTH	GA	145.0100		860413
WB4GQX-3	DIGIPEATER	CUMMINGS	GA	145.0100		861101
WB4GQX-4	DIGIPEATER	AMICOLOLA FALLS	GA	145.0900		860206

Call	Type	City	State	Frequency	Grid	Updated
K4HAL-1	DIGIPEATER	MT CHEAHA	AL	145.0100		861101
K4HAL-2	DIGIPEATER	BIRMINGHAM	AL	145.6700		860714
K4HAL-2	DIGIPEATER	BIRMINGHAM	AL	448.4000		860714
W4HFU-2	DIGIPEATER	HUNTSVILLE	AL	145.0100		860714
W4HFU-4	DIGIPEATER	HUNTSVILLE	AL	448.4000		860714
WD4HIM	PBBS	ORLANDO	FL	14.1030		860413
WD4HIM	PBBS	ORLANDO	FL	145.0100		860413
N4HMD	PBBS	SHALIMAR	FL	145.0100		861130
N4HRU	PBBS	FAIRDALE	KY	145.0100		861130
WD4HXG	PBBS	STERLING	VA	145.0700		870331
N4HY	PBBS	AUBURN	AL	145.0100		861101
N4HY-1	DIGIPEATER	AUBURN	AL	145.0100		861101
WB4HYP	PBBS	OVIEDO	FL	145.0100		870301
W4IAX	DIGIPEATER	MOBILE	AL	145.0100		860714
K4ICT	PBBS	MACON	GA	145.0100		860204
K4ICT-1	DIGIPEATER	PERRY	GA	145.0100		861101
K4ICT-3	DIGIPEATER	MACON	GA	145.0100		861101
K4IWW	PBBS	CARY	NC	145.0100		860413
KF4JF	PBBS	HAHIRA	GA	14.1070		870103
KF4JF	PBBS	HAHIRA	GA	145.0100		870103
KF4JF-1	DIGIPEATER	TIFTON	GA	145.0100		870103
WB4JFI-5	DIGIPEATER	WASHINGTON	DC	145.0100		860925
N4JGO	DIGIPEATER	RESTON	VA	145.0000		870331
KF4JF-1	PBBS	TIFTON	GA	14.1070		860413
NK4K	PBBS	MIAMI	FL	145.0100		860413
W4KAU	PBBS	COHUTTA	GA	145.0100		860206
W4KAU	DIGIPEATER	COHUTTA	GA	145.0900		860206
W4KAU	PBBS	COHUTTA	GA	145.0900		860206
WD4KAV	PBBS	PT. ST. LUCIE	FL	145.0100		870120
WD4KAV	DIGIPEATER	STUART	FL	145.0100		860413
W4KDP-3	DIGIPEATER	TUSCALOOSA	AL	145.6700		860714
KJ4KR-1	PBBS	GERMANTOWN	TN	145.0100		861118
WA4KXV-1	DIGIPEATER	VIRGINIA BEACH	VA	145.0100	FM16	870331
WA4KXV-2	DIGIPEATER	VIRGINIA BEACH	VA	145.0500	FM16	870331
AA4L	PBBS	RALEIGH	NC	145.0100		870120
KK4L	PBBS	CHARLOTTE	NC	145.0100		870301
WD4LHF	PBBS	WEST PALM BEACH	FL	145.0100		860413
K4LKO-1	DIGIPEATER	TOBACCO ROAD MT.	VA	145.0100		870331
K4LKO-2	DIGIPEATER	GREENSBORO	NC	145.0100		860413
WA4LPD	PBBS	RALEIGH	NC	145.0100		870120
K4LPT-1	DIGIPEATER	CRESTVIEW	FL	145.0100		861101
WA4LWE-1	DIGIPEATER	FANCY GAP	VA	145.0100		870331
N4LYF	DIGIPEATER	CHARLESTON	SC	145.0100		861101
N4LYF-1	DIGIPEATER	SAVANAH	GA	145.0100		861101
WD4LYV-1	DIGIPEATER	SYCAMORE	GA	145.0100		861101
W4MDW-1	DIGIPEATER	HICKORY	NC	145.0100		861101
WD4MIZ	PBBS	VIRGINIA BEACH	VA	145.0100	FM16	870331
WD4MIZ	PBBS	VIRGINIA BEACH	VA	145.0500	FM16	870331
K4MJM	PBBS	PIKESVILLE	TN	145.0100		870120
AA4MW	DIGIPEATER	MESA	AZ	145.0100		860101
N4NAU-1	DIGIPEATER	ANNISTON	AL	145.6700		860714
KF4NB	PBBS	LEXINGTON	KY	145.0100		870120
KF4NB	PBBS	LEXINGTON	KY	145.0900		870120
KD4NC	PBBS	SWEAT MT.	TN	145.0100		860204
KD4NC-1	PBBS	MARIETTA	GA	145.0100		861101
K4NGC	PBBS	DALE CITY	VA	145.0100	FM18io	870331
K4NGC-1	PBBS	DALE CITY	VA	145.0700	FM18io	870331
K4NGC-2	PBBS	DALE CITY	VA	221.0100	FM18io	870331
KB4NK-1	PBBS	OAK RIDGE	TN	145.0100		861101
AA4NL	DIGIPEATER	TYSONS CORNER	VA	221.0100		870331

Call	Type	City	State	Frequency	Grid	Updated
KA4NOF-1	PBBS	WEST PALM BEACH	FL	145.0100		860204
K4NTA	PBBS	STUART	FL	14.1070		870301
K4NTA	PBBS	STUART	FL	145.0100		870301
K4NTA	PBBS	STUART	FL	145.0300		870120
W4NTG-4	DIGIPEATER	TOANO	VA	145.0100		870331
KB4OB-1	DIGIPEATER	FREDERICKSBURG	VA	145.0100		870331
KB4OB-2	DIGIPEATER	FREDERICKSBURG	VA	145.0500		870331
WA4OHX	PBBS	HAMPTON	VA	145.0100		870331
KC4OI	PBBS	POWELL	TN	145.0100		870120
WA4ONG	PBBS	RICHMOND	VA	145.0500		870331
WD4OQC	PBBS	CLEVELAND	TN	145.0100		861101
KA4OVX	PBBS	CONYERS	GA	145.0100		861101
K4OZM	PBBS	ORLANDO	FL	145.0100		860204
WB4OZN	PBBS	MONTGOMERY	AL	145.0100		861101
K4OZS	PBBS	OCALA	FL	145.0100		860413
AA4PB-1	DIGIPEATER	GARRISONVILLE	VA	145.0100	FM18	870331
WA4PGI-1	DIGIPEATER	COVINGTON	VA	145.0100		870331
N4QQ	PBBS	SILVER SPRING	MD	145.0600		870301
N4QQ	PBBS	SILVER SPRING	MD	145.0600		870301
AA4RE-1	PBBS	GILROY	CA	145.0100		860204
WB4RHO-1	DIGIPEATER	EUFAULA	AL	145.0100		861101
WB4RHO-2	DIGIPEATER	HEADLAND	AL	145.0100		861101
WD4ROJ-1	DIGIPEATER	ENTERPRISE	AL	145.0100		861101
WA4RTS	PBBS	LYNCHBURG	VA	145.0100		870331
WA4RTS	PBBS	LYNCHBURG	VA	145.0500		870331
W4RXG-1	DIGIPEATER	WINSTON-SALEM	NC	145.0100		861101
WX4S	PBBS	JOHNSON CITY	TN	145.0100		870120
W4SP-1	DIGIPEATER	SUMTER	SC	145.0100		861101
WA4SWF-1	DIGIPEATER	LOUISA	KY	145.0100		861101
WA4SZK	PBBS	FLORENCE	SC	14.1090		870120
WA4SZK	PBBS	FLORENCE	SC	145.0100		870301
KF4TE	DIGIPEATER	DALE CITY	VA	145.0700		870331
WA4TFZ-2	PBBS	CHARLOTTESVILLE	VA	145.0100	FM08sa	870331
K4TKU	PBBS	MIAMI	FL	145.0100		870301
K4TKU-1	PBBS	MIAMI	FL	14.1090		870103
WB4TOM-1	DIGIPEATER	COLUMBUS	GA	145.0100		861101
WA4TSC-1	DIGIPEATER	MIDDLEBURG	VA	145.0100		870331
KF4TT-6	DIGIPEATER	GAINSVILLE	FL	145.0100		860413
WA4TXT-1	DIGIPEATER	HAMPTON	GA	145.0100		861101
W4ULH-1	DIGIPEATER	FLORENCE	SC	145.0100		861101
WB4ULJ-1	DIGIPEATER	PINE MT.	GA	145.0100		861101
K4UMI-5	DIGIPEATER	HAMPTON	VA	145.0100		870331
KA4VEY-1	DIGIPEATER	ANDERSON	AL	145.0100		860714
W4VFR-1	DIGIPEATER	STATEVILLE	SC	145.0100		861201
WA4VMV	PBBS	ATLANTA	GA	145.0100		870120
KC4VR-1	DIGIPEATER	SAND MT.	VA	145.0100		870331
KJ4WA	DIGIPEATER	FORT BELVOIR	VA	145.0700		870331
K4WJR-1	DIGIPEATER	LANCASTER	SC	145.0100		861101
N4XI	PBBS	EVANSVILLE	IN	14.1090		870103
N4XI	PBBS	EVANSVILLE	IN	145.0100		861130
KI4XO	PBBS	ATLANTA	GA	14.1090		870310
KI4XO	PBBS	ATLANTA	GA	145.0100		870310
WA4YXA-1	DIGIPEATER	HUNTSVILLE	AL	145.0100		860714
KB4ZJ-5	DIGIPEATER	MCLEAN	VA	145.0300		870331
WB4ZKX-1	PBBS	MADISON	AL	145.0100		861101
WB4ZKX-1	DIGIPEATER	MADISON	AL	448.4000		860714
WA4ZLW	PBBS	BOCA RATON	FL	145.0100		870120
WB4ZNW	PBBS	MOULTRIE	GA	145.0100		860206
WB4ZNW	DIGIPEATER	MOULTRIE	GA	145.0100		860413
WB5AAA	DIGIPEATER	BREAUX RIDGE	LA	145.0100		861118

Call	Type	City	State	Frequency	Grid	Updated
KD5B	PBBS	GAUTIER	MS	14.1090		861130
WD5B	PBBS	LITTLE ROCK	AR	14.1090		870301
WD5B	PBBS	LITTLE ROCK	AR	145.0900		870301
WB5BBW	PBBS	HOUSTON	TX	145.0100		861130
KA5BEM-1	PBBS	ALBUQUERQUE	NM	145.0100		861130
N5BGC	PBBS	SANTA FE	NM	145.0100		861130
WA5BOX-1	DIGIPEATER	EDMOND	OK	145.0100		861118
N5BSL	PBBS	BASTROP	MS	145.0100		870102
WB5BZE	PBBS	NEW ORLEANS	LA	145.0100		861130
NI5C	PBBS	BATESVILLE	AR	145.0100		861118
NA5C-1	DIGIPEATER	MC ALLEN	TX	145.0100		861118
KN5D	PBBS	ALBUQUERQUE	NM	14.1090		870103
NU5D-1	DIGIPEATER	MC KINNEY	TX	145.0100		861118
W5DDL	PBBS	LAFAYETTE	LA	145.0100		861130
WA5DVV	PBBS	GULFPORT	MS	7.0930		870301
WA5DVV	PBBS	GULFPORT	MS	14.1090		870301
WA5DVV	PBBS	GULFPORT	MS	145.0100		860714
WA5DVV	PBBS	GULFPORT	MS	145.0900		870301
N5DWU	PBBS	ELLISVILLE	MS	145.0100		870102
N5EDH	PBBS	CAMP VERDE	AZ	14.1070		870120
N5EDH	PBBS	CAMP VERDE	AZ	145.0100		870120
N5EG	DIGIPEATER	PLANO	TX	145.0100		861118
KA5EJV-1	DIGIPEATER	FREER	TX	145.0100		861118
WB5EKU-2	DIGIPEATER	OAT MT.	CA	145.3600		870131
WB5EKU-2	DIGIPEATER	OAT MT.	CA	220.9500		870131
WB5EKU-2	DIGIPEATER	OAT MT.	CA	220.9500		870131
W5ERO	PBBS	SAN ANTONIO	TX	145.0100		861130
N5EV-5	DIGIPEATER	ANDREWS AFB	MD	145.0300		861201
WB5EWM-1	DIGIPEATER	CLINTON	MS	145.0100		861118
WD5GAZ	PBBS	HOUSTON	TX	14.1050		860204
WD5GAZ	PBBS	HOUSTON	TX	145.0100		870102
WB5HLR-1	DIGIPEATER	SALLISAW	OK	145.0900		861118
K5HYE	DIGIPEATER	MENDENHALL	MS	145.0100		861118
KF5IZ	PBBS	JACKSON	MS	145.0100		861118
KC5JH	PBBS	LITTLE ROCK	AR	145.0100		861118
N5JKN	PBBS	POTEAU	OK	145.0100		861118
WD5JLI	PBBS	HOUSTON	TX	145.0100		860204
WA5JXY-1	PBBS	EL PASO	TX	145.0100		870120
KE5L-1	DIGIPEATER	BASTROP	LA	145.0100		861118
WA5MWD	PBBS	GARLAND	TX	145.0100		870102
KB5OQ-1	DIGIPEATER	ELKHART	TX	145.0100		861118
KB5PM	PBBS	AUSTIN	TX	145.0100		870102
AI5R	DIGIPEATER	ARLINGTON	TN	145.0100		861118
WA5DAX	PBBS	BESSEMER	AL	145.0100		861101
WA5DAX	PBBS	BESSEMER	AL	145.6700		860714
KR5S	PBBS	SEDONA	AZ	7.0930		861201
KR5S	PBBS	SEDONA	AZ	14.1090		870120
KR5S	PBBS	SEDONA	AZ	145.0100		870120
KF5SE-1	PBBS	PALESTINE	TX	145.0100		861118
W5SEP	DIGIPEATER	WINSLOW	AR	145.0100		861118
WB5EXK	PBBS	VICKSBURG	MS	145.0100		870102
WA5SZL-1	PBBS	RALEIGH	NC	145.0100		861101
WB5TTU	PBBS	HUGO	OK	145.0100		861118
AF5U	PBBS	RICHARDSON	TX	145.0300		861118
WA5VDM	PBBS	LAKE CHARLES	LA	145.0100		861130
WA5VRL-1	DIGIPEATER	LOVELAND	CO	145.0300		861018
WA5WHN	PBBS	ALBUQUERQUE	NM	145.0100		861130
KE5WO	DIGIPEATER	PORT GIBSON	MS	145.0100		861118
N5WX-1	PBBS	TULSA	OK	145.0500		861118
WS5X	PBBS	BATON ROUGE	LA	145.0100		861130

Call	Type	City	State	Frequency	Grid	Updated
W5XO	PBBS	GAUSE	TX	7.0930		870310
W5XO	PBBS	GAUSE	TX	14.1090		870310
W5XO	PBBS	GAUSE	TX	145.0100		870310
KA5ZEC-1	PBBS	LAS CRUCES	NM	145.0100		870120
WA5ZOS	PBBS	BRYAN	TX	145.0100		870102
WB6AIE	PBBS	FRESNO	CA	145.0300		861201
WB6AIE	PBBS	FRESNO	CA	145.0500		870111
WB6AIE-1	DIGIPEATER	BALD MT.	CA	145.0500		870111
W6AK-1	DIGIPEATER	MT. VACA	CA	145.0500		870111
W6AMT	DIGIPEATER	CRYSTAL PEAK	CA	145.0100		870120
W6AMT	DIGIPEATER	CRYSTAL PEAK	CA	223.5800		870201
W6AMT-1	DIGIPEATER	WILLIAMS HILL	CA	145.0100		870120
W6AMT-2	DIGIPEATER	SANTA YNEZ	CA	145.0100		870120
W6AMT-3	DIGIPEATER	PALOS VERDES	CA	145.0100		870120
W6AMT-4	DIGIPEATER	SAN MIGUEL MT.	CA	145.0100		870120
W6AMT-7	DIGIPEATER	ST. JOHN MT.	CA	145.0100		870120
K6ATQ-1	DIGIPEATER	SAN MARCOS	CA	145.0500		861201
N6ATQ-1	DIGIPEATER	SAN MARCOS	CA	145.0500		870111
WD6BFC	PBBS	REDDING	CA	145.0100		870120
WD6BFN	PBBS	BURBANK	CA	145.0100		861201
N6BGW-9	PBBS	CARSON	CA	145.0100		861201
N6BGW-9	PBBS	CARSON	CA	145.0500		861201
N6BGW-9	PBBS	CARSON	CA	145.0900		861201
N6BGW-9	PBBS	CARSON	CA	146.7450		861201
N6BMQ-1	DIGIPEATER	SIERRA PEAK	CA	145.0100		870120
KE6BX	PBBS	HOLLISTER	CA	145.0100		870120
KE6BX	PBBS	HOLLISTER	CA	145.0900		870120
W6BXN	DIGIPEATER	TURLOCK	CA	145.0100		850416
W6BXN	DIGIPEATER	TURLOCK	CA	145.0300		861201
AI6C	DIGIPEATER	COLORADO SPRINGS	CO	145.0900		861018
KB6C-1	DIGIPEATER	FRAZIER MT.	CA	145.0500		870111
KB6C-4	DIGIPEATER	MT. OSO	CA	145.0500		870111
WB6CFO-1	PBBS	LIVERMORE	CA	145.0700		861201
WD6CMU-1	DIGIPEATER	BERKELEY	CA	145.0900		861201
N6CUS-1	PBBS	HACIENDA HEIGHTS	CA	145.0300		861201
N6CUS-1	PBBS	HACIENDA HEIGHTS	CA	146.7450		861201
W6CUS-1	PBBS	RICHMOND	CA	7.9300		861201
W6CUS-1	PBBS	RICHMOND	CA	14.1030		861201
W6CUS-1	PBBS	RICHMOND	CA	14.1070		861201
W6CUS-1	PBBS	RICHMOND	CA	145.0100		860204
W6CUS-1	PBBS	RICHMOND	CA	145.0300		861201
W6CUS-1	PBBS	RICHMOND	CA	145.0500		861201
W6CUS-1	PBBS	RICHMOND	CA	145.0900		861201
KA6DAC-1	DIGIPEATER	MONUMENT PARK	SD	145.0500		870111
WB6EGR-1	DIGIPEATER	MT. LEE	CA	145.0500		861201
WD6EJF-1	DIGIPEATER	MT. OSO	CA	145.0100		870120
KA6ENO-1	DIGIPEATER	KNEELAND	CA	145.0500		870120
WA6ERB	PBBS	LAKEWOOD	CO	14.1050		860204
WA6ERB	PBBS	LAKEWOOD	CO	145.0100		870120
WA6ERB	PBBS	LAKEWOOD	CO	145.0500		870120
KA6ERF	PBBS	NAPA	CA	145.0900		861201
KA6EYH-1	DIGIPEATER	SKYLINE	CA	145.0100		870120
AJ6F-1	PBBS	TORRANCE	CA	145.0700		870131
AJ6F-1	PBBS	TORRANCE	CA	145.3600		870131
W6FGC-2	DIGIPEATER	TWAINE HARTE	CA	145.0500		870111
WA6FSP-1	DIGIPEATER	PALO ALTO	CA	145.0300		861201
KD6GF-1	DIGIPEATER	MT. VACA	CA	145.0100		870120
N6GPP-1	DIGIPEATER	MT. BILL	CA	145.0100		870120
N6GPP-1	DIGIPEATER	MT. BILL	CA	146.1450		870120
W6GRR-1	DIGIPEATER	MCKITTRICK PEAK	CA	145.0100		870120

Call	Type	City	State	Frequency	Grid	Updated
W6GRR-1	DIGIPEATER	MCKITTRICK PEAK	CA	145.0300		870120
NW6H-1	DIGIPEATER	EL PASO MTS.	CA	145.0100		870120
N6HAV	PBBS	FRESNO	CA	145.0100		861201
WB6HHV-1	DIGIPEATER	SAN DIEGO	CA	145.0100		870120
AI6I-1	DIGIPEATER	HEMET	CA	145.0500		861201
N6IIU-1	PBBS	PALO ALTO	CA	145.0100		861201
N6IIU-1	DIGIPEATER	PALO ALTO	CA	145.0700		861201
N6IJB-1	DIGIPEATER	ELK RIDGE	CA	145.0500		870120
N6IJP-1	DIGIPEATER	ANGWIN	CA	145.0100		870120
N6IJP-1	DIGIPEATER	ANGWIN	CA	145.0900		861201
KA6IQA	PBBS	TORREY PINES	CA	145.0100		870120
KA6IQA	PBBS	TORREY PINES	CA	145.0500		861201
KA6IQA-1	DIGIPEATER	TORREY PINES	CA	145.0100		870120
W6IXU	PBBS	ARROYO GRANDE	CA	145.0100		870120
W6IXU	PBBS	ARROYO GRANDE	CA	145.0500		861201
N6JFT-1	DIGIPEATER	LOMA LINDA	CA	145.0500		861201
N6JIX	DIGIPEATER	NORTH HOLLYWOOD	CA	145.0500		861201
WA6JOY	DIGIPEATER	SPRINGFIELD	VA	145.0700	FM18qf	870331
NK6K-1	PBBS	REDONDO BEACH	CA	145.0100		870131
NK6K-2	PBBS	REDONDO BEACH	CA	145.3600		870131
WB6KAJ	PBBS	BREA	CA	14.1090		870301
WB6KAJ	PBBS	BREA	CA	145.0100		861130
WB6KAJ-1	PBBS	BREA	CA	145.3600		870301
WB6KAJ-2	DIGIPEATER	SIERRA PEAK	CA	145.3600		861201
WB6KAJ-2	DIGIPEATER	SIERRA PEAK	CA	145.3600		870131
WB6KOY	PBBS	POMONA	CA	145.0100		870131
WB6KOY	PBBS	POMONA	CA	145.3600		870131
WB6LPZ-1	DIGIPEATER	SAN JOSE	CA	145.0300		861201
KE6LT	PBBS	BOULDER	CO	145.0100		870120
N6LUC-1	PBBS	CAMARILLO	CA	145.0300		870131
N6LUC-1	PBBS	CAMARILLO	CA	145.3600		870131
N6LYF-1	DIGIPEATER	SAN LUIS OBISPO	CA	145.0500		870111
N6MPW-1	DIGIPEATER	BEN LOMOND	CA	145.0900		861201
N6MVS	PBBS	SAN BERNARDING	CA	145.0500		861201
KA6NEO-1	DIGIPEATER	KNEELAND	CA	145.0500		870120
WA6NWE	PBBS	NORTH HIGHLANDS	CA	145.0500		861201
W6NWG	DIGIPEATER	MT. PALOMAR	CA	145.0100		861201
W6NWG	DIGIPEATER	MT. PALOMAR	CA	145.0500		870111
W6OGC	DIGIPEATER	MT. OTAY, SAN DIEGO	CA	144.7600		870111
WA6OSA-1	DIGIPEATER	MT. STEPHENSON	CA	145.0100		870120
WA6OSA-2	PBBS	CLOVIS	CA	145.0100		870120
WA6OZJ	DIGIPEATER	VERDES	CA	145.0500		870111
W6PW-1	DIGIPEATER	SAN FRANCISCO	CA	145.0300		861201
W6PW-3	DIGIPEATER	SAN FRANCISCO	CA	223.5800		870201
K6QIF	DIGIPEATER	SACRAMENTO	CA	145.0100		850416
WB6QKP-1	PBBS	NUEVO	CA	145.0500		861201
KB6QL	DIGIPEATER	NORTHGLEEN	CO	145.0500		861018
K6RD	PBBS	LOS ANGELES	CA	145.0300		861201
WB6RIW-1	DIGIPEATER	BIG BEAR LAKE	CA	145.3600		870131
WB8RON	DIGIPEATER	GERMANTOWN	MD	145.0500		861021
WA6RWN	DIGIPEATER	VISALIA	CA	145.0100		850416
W6SE	DIGIPEATER	SAN DIEGO	CA	145.3600		870131
W6SG-1	DIGIPEATER	SAN RAFAEL	CA	145.0500		861201
KA6SOX-1	DIGIPEATER	WESTMINSTER	CA	145.0100		850416
KD6SO	PBBS	RANCHO CUCAMONGA	CA	14.1070		870131
KD6SQ	PBBS	RANCHO CUCAMONGA	CA	145.0100		860204
KD6SQ	PBBS	RANCHO CUCAMONGA	CA	145.0500		861201
KD6SQ	PBBS	RANCHO CUCAMONGA	CA	145.3600		870131
KD6TH	DIGIPEATER	WYCOFF	NJ	145.0100		861015
KD6TH	DIGIPEATER	WYCOFF	NJ	145.0500		861015

Call	Type	City	State	Frequency	Grid	Updated
KD6TH	DIGIPEATER	WYCOFF	NJ	221.0100		861015
KD6TH-1	PBBS	WYCOFF	NJ	145.0100		870310
KD6TH-1	PBBS	WYCOFF	NJ	145.0700		860803
WA6TLW-1	DIGIPEATER	SLIDE MT.	CA	145.0100		870120
AA6TN-1	DIGIPEATER	BIG BEAR MT.	CA	145.0100		870120
K6TZ-2	DIGIPEATER	SANTA BARBARA	CA	145.0500		870111
KA6UJF	DIGIPEATER	SAN JOSE	CA	145.0500		870111
WA6VSE	DIGIPEATER	FULLERTON	CA	145.0100		870120
WA6YBT	DIGIPEATER		PA	145.0500		870201
K6YGX-1	DIGIPEATER	NORTHRIDGE	CA	145.0300		861201
WA6YLB	DIGIPEATER	TULARE	CA	145.0500		870111
WB6YMH-2	PBBS	PALOS VERDES	CA	145.0100		861201
WB6YMH-2	PBBS	PALOS VERDES	CA	145.0300		861201
WB6YMH-2	PBBS	PALOS VERDES	CA	145.0500		861201
WB6YMH-2	PBBS	PALOS VERDES	CA	145.0900		861201
WB6YMH-2	PBBS	PALOS VERDES	CA	145.3600		870301
WA6YNG-1	DIGIPEATER	SHASTA BALLY	CA	145.0500		870111
WA6YXV-1	DIGIPEATER	MT. TAMALPAIS	CA	145.0100		870120
NV6Z	PBBS	SAN JOSE	CA	145.0700		861201
WD6Z-1	DIGIPEATER	CUESTA PEAK	CA	145.0100		870120
W6ZFN-1	DIGIPEATER	COALINGA	CA	145.0100		870120
W6ZFN-1	DIGIPEATER	FRESNO	CA	145.0300		861201
W6ZFN-2	DIGIPEATER	PALMDALE	CA	145.0100		870120
WA6ZSN-1	DIGIPEATER	VENTURA	CA	145.0300		861201
KB7AG	DIGIPEATER	KINGMAN	AZ	145.0100		870120
WN7ANK-5	DIGIPEATER	MUD MT.	WA	145.0100		870120
KE7AU	PBBS	OREM	UT	145.0300		870111
WB7AWO-1	DIGIPEATER	HORNBROOK	CA	145.0100		870120
KF7B	DIGIPEATER	PHOENIX	AZ	145.0100		860101
WB7BEG	PBBS	PROVO	UT	145.0300		870111
N7BI-4	DIGIPEATER	MICA PEAK	WA	145.0100		870120
WB7BNI	PBBS	UNION MT.	AZ	145.0100		870120
WB7BNI-1	DIGIPEATER	UNION MT.	AZ	145.0100		870120
WB7BNI-1	DIGIPEATER	UNION MT.	AZ	145.1100		870120
WB7BPI-1	DIGIPEATER	KING MOUNTAIN	OR	145.0100		870120
K7BUC	PBBS	PHOENIX	AZ	14.1000		861130
N7CEU	DIGIPEATER	WEST VALLEY	UT	145.0100		870111
KE7CZ	PBBS	DEWEY	AZ	7.0930		870120
KE7CZ	PBBS	DEWEY	AZ	14.1050		860204
KE7CZ	PBBS	DEWEY	AZ	145.0100		870120
KE7CZ-1	PBBS	MINGUS MT.	AZ	145.0100		870120
WB7DCH	PBBS	ENUMCLAW	WA	14.1090	CN97	870103
WB7DCH	PBBS	ENUMCLAW	WA	145.0100	CN97	870120
N7DME	DIGIPEATER	TUCSON	AZ	145.0100		860101
N7DME-1	PBBS	TUCSON	AZ	145.0100		860101
KA7DXJ	PBBS	CHEYENNE	WY	145.0100		870120
NY7E	DIGIPEATER	KEARNS	UT	145.0300		870111
K7EA-1	DIGIPEATER	PIX PEAK	UT	145.0100		870120
K7ENE-1	DIGIPEATER	IDAHO FALLS	ID	145.0100		870120
N7EOC-1	DIGIPEATER	SHERIDAN	WY	145.0100		861119
N7EVB-1	DIGIPEATER	JACKFLAT RIDGE	CA	145.0100		870120
KD7GL	DIGIPEATER	GLENDALE	AZ	145.0100		860101
W7GNP-1	DIGIPEATER	GREENS PEAK	AZ	145.0100		870120
N7GRN-1	DIGIPEATER	BELLEVUE	WA	145.0100		870120
WA7GTU	DIGIPEATER	CEDAR CITY	UT	145.0100		870120
WA7GTU-1	DIGIPEATER	IRON MT.	UT	145.0100		870120
WA7GTU-2	DIGIPEATER	FRISCO PEAK	UT	145.0100		870120
WA7HDI	DIGIPEATER	OAK HARBOR	WA	145.0100		870120
N7HQK	PBBS	CEDAR CITY	UT	145.0100		870120
K7IFG	DIGIPEATER	MT. LIVINGSTON	CO	145.0100		870120

Call	Type	City	State	Frequency	Grid	Updated
K7IFG	PBBS	PORTLAND	OR	145.0100		861130
WA7IJU-1	PBBS	CHEYENNE	WY	145.0100		861130
WA7JOF	DIGIPEATER	WEST VALLEY	UT	145.0100		870111
W7KMF-1	DIGIPEATER	DUBOIS	WY	145.0100		861119
KB7KY	DIGIPEATER	TEMPE	AZ	145.0100		860101
K7MBJ-1	DIGIPEATER	CODY	WY	145.0100		861119
WA7MBL	PBBS	LOGAN	UT	145.0100		870120
K7MM-5	DIGIPEATER	RIVERTON	WY	145.0100		861119
WA7MXZ-1	DIGIPEATER	MT. PISGAH	UT	145.0100		870120
WA7MXZ-2	PBBS	LOGAN	UT	145.0100		870111
KE7OM	PBBS	NORTH BEND	WA	145.0100		861130
KD7OT	DIGIPEATER	SANDY	UT	145.0100		870111
KD7PK	PBBS	LAS VEGAS	NV	145.0100		861130
K7PYK	PBBS	SCOTTSDALE	AZ	14.1090		870103
K7PYK	PBBS	SCOTTSDALE	AZ	145.0100		861130
WB7QKK	DIGIPEATER	GILBERT	AZ	145.0100		860101
WB7QKP-1	PBBS	NUEVO	CA	145.0500		861201
WB7QKP-2	DIGIPEATER	NUEVO	CA	145.0500		861201
WB7QWG	PBBS	WESTFIELD	IN	145.0100		860204
WB7RFS	DIGIPEATER	OREM	UT	145.0100		870111
K7RJ	DIGIPEATER	WEST VALLEY	UT	145.0100		870301
KA7RMA-1	PBBS	BOISE	ID	145.0100		870120
WB7RND	DIGIPEATER	SALT LAKE	UT	145.0100		870111
W7SC	DIGIPEATER	BOISE	ID	145.0100		870120
KA7SHX-1	DIGIPEATER	KEMMERER	WY	145.0100		861119
WB7SOW	DIGIPEATER	WEST JORDAN	UT	145.0900		870111
WA7SSO	PBBS	STATE COLLEGE	PA	145.0100		870324
WA7SVN	DIGIPEATER	OREM	UT	145.0100		870111
WB7SZM-1	DIGIPEATER	ROXY ANNE	OR	145.0100		870120
WB7TGF-1	DIGIPEATER	OLYMPIA	WA	145.0100		870120
WA7TJU-1	PBBS	CHEYENNE	WY	145.0100		861119
WB7TPY	DIOIPEATER	SCOTTSDALE	AZ	145.0100		860101
WB7TRX	PBBS	SALT LAKE CITY	UT	145.0100		870111
WB7TSY	DIGIPEATER	LEHI	UT	145.0100		870111
KB7TV	PBBS	BOYNTON BEACH	FL	145.0100		870301
WA7UHW-1	DIGIPEATER	MT. HARRISON	ID	145.0100		870120
WA7UZO	PBBS	SALT LAKE CITY	UT	145.0100		870120
KA7VEE	PBBS	EVERETT	WA	145.0100		861130
W7VEW-1	DIGIPEATER	LANDER	WY	145.0100		861119
WA7WAB-1	DIGIPEATER	BLUE MOUNTAIN	CO	145.0100		870120
K7WS-1	DIGIPEATER	MT. POTOSI	NV	145.0100		870120
K7WS-2	DIGIPEATER	ANGEL PEAK	NV	145.0100		870120
K7WS-3	DIGIPEATER	GOLDFIELD	NV	145.0100		870120
K7WS-4	DIGIPEATER	CHRISTMAS TREE	NV	145.0100		870120
WB7WTS-1	DIGIPEATER	CAVE MT.	NV	145.0100		870120
W7XI	PBBS	PORTLAND	OR	145.0100		870120
W7XI-1	DIGIPEATER	MT. LIVINGSTON	OR	145.0100		870120
N7XS-1	DIGIPEATER	POCATELLO	ID	145.0100		870120
KS7Y-1	PBBS	PRAIRIE PEAK	OR	145.0100		870120
WA7YAZ	DIGIPEATER	SALT LAKE CITY	UT	145.0100		870120
KD7YG-1	DIGIPEATER	FORBES RIDGE	UT	145.0100		870120
KD7YK-1	DIGIPEATER	OREM	UT	145.0100		870120
KD7YK-2	DIGIPEATER	SNOWBIRD PEAK	UT	145.0100		870120
W7ZAC-1	DIGIPEATER	CASPER	WY	145.0100		861119
K7ZVV-1	DIGIPEATER	LONGVIEW	WA	145.0100		870120
WA7ZWO	DIGIPEATER	KINGMAN	AZ	145.0100		870120
AI8A-2	DIGIPEATER	LOS GATOS	CA	145.0700		861201
W8AC	DIGIPEATER	CHARDON	OH	145.0100		851112
N8ACV	PBBS	DAYTON	OH	145.0100		861130
N8AGS-1	PBBS	SPRING LAKE	MI	145.0100		850926

Call	Type	City	State	Frequency	Grid	Updated
WB8BGY	DIGIPEATER	ALBION	MI	145.0100		861112
N8BMA	PBBS	DETROIT	MI	145.0100		861130
N8BMA	PBBS	DETROIT	MI	221.0100		860204
KJ8C	PBBS	HOLLAND	MI	145.0100		861130
KU8C	DIGIPEATER	FAIRMONT	WV	145.0100		861101
KB8CI	PBBS	CLEVELAND	OH	14.1070		860204
KB8CI	PBBS	CLEVELAND	OH	145.0100		870301
WB8CNN-1	DIGIPEATER	BECKLEY	WV	145.0100		861101
WB8CQR	DIGIPEATER	CLEVELAND	OH	145.0100		851112
WD8DHS	DIGIPEATER	BATTLE CREEK	MI	145.0100		851112
WA8EJH	DIGIPEATER	BLOOMINGTON	IN	145.0100		850926
WA8EJH-2	PBBS	BLOOMINGTON	IN	145.0100		850926
W8ELE	DIGIPEATER	GALLOWAY	OH	145.0100		851112
N8EMR	DIGIPEATER	COLUMBUS	OH	145.0100		851112
N8ERI	DIGIPEATER	MT. GILEAD	OH	145.0100		851112
WA8ERQ	PBBS	BLANCHESTER	OH	145.0100		861130
N8ET	PBBS	FINDLAY	OH	145.0100		870301
KA8EUU-1	DIGIPEATER	HUNTINGTON	WV	145.0100		861101
N8FIS	PBBS	FREMONT	OH	145.0100		861130
N8FJB	PBBS	BAKERTON	WV	145.0100		870301
N8FJB	PBBS	BAKERTON	WV	145.0500		861225
WB8FQJ-1	DIGIPEATER	BLAIR MTN, LOGAN	WV	145.0100		861101
N8FSY	DIGIPEATER	ST. CLAIRSVILLE	OH	145.0100		851112
W8GRG	PBBS	SHAKER HTS.	OH	145.0500		870301
N8GVG	DIGIPEATER	MONROE	MI	145.0100		851112
WA8HGL	PBBS	FAYETTEVILLE	NC	145.0100		870301
AD8I	PBBS	CIRCLEVILLE	OH	14.1090		861130
AD8I	PBBS	CIRCLEVILLE	OH	145.0100		870301
AD8J-1	DIGIPEATER	PITTSBURGH	PA	145.0100		870111
KC8JN	PBBS	WINTERSVILLE	OH	145.0100		870301
W8KOX-1	DIGIPEATER	DETROIT	MI	145.0100		851112
WB8LEA	DIGIPEATER	YOUNGSTOWN	OH	145.0100		851112
K8LG	DIGIPEATER	MORGANTOWN	WV	145.0100		851112
WB8LVP	PBBS	POLAND	OH	14.1030		860204
WB8LVP	PBBS	POLAND	OH	145.0100		861130
WB8LYF	DIGIPEATER	KENTON	OH	145.0100		851112
K8MMO	PBBS	OAKTON	VA	14.1090		870331
K8MMO	PBBS	OAKTON	VA	145.0700		870331
KB8NH	PBBS	FORT WAYNE	IN	145.0100		861130
W8OG	DIGIPEATER	DAYTON	OH	145.0100		851112
WB8OUE	DIGIPEATER	PHOENIX	AZ	145.0100		860101
WB8QBN	DIGIPEATER	CLEVELAND	OH	145.0100		851112
K8SLI-1	DIGIPEATER	ST ALBANS	WV	145.0100		851101
K8SRB	DIGIPEATER	KENTON	OH	145.0100		851112
KC8TW	PBBS	CINCINNATI	OH	145.0100		870120
KC8U	DIGIPEATER	COLUMBUS	OH	145.0100		851112
WA8URE	PBBS	GRAND RAPIDS	MI	145.0100		861130
WA8USO-1	DIGIPEATER	RAVENSWOOD	WV	145.0100		861101
WD8UU	DIGIPEATER	YOUNGSTOWN	OH	145.0100		851112
WB8WGA	PBBS	GAHANNA	OH	14.1050		851112
WB8WGA	PBBS	GAHANNA	OH	145.0100		851112
B8WKA	PBBS	SOUTHFIELD	MI	145.0100		860204
AD8Y	PBBS	ANN ARBOR	MI	145.0100		860204
K8YTE	DIGIPEATER	RALEIGH	NC	145.0100		861101
WA8YVR	PBBS	BLOOMINGTON	IN	145.0100		870324
KA8YYW-1	DIGIPEATER	WILLIAMSON	WV	145.0100		861101
WA8ZIA-1	PBBS	BOULDER	CO	145.0100		870120
WB8ZKI	DIGIPEATER	OUTVILLE	OH	145.0100		851112
KC8ZQ	PBBS	COLUMBUS	OH	145.0100		861130
KD8ZR-1	DIGIPEATER	TERRA ALTO	WV	145.0100		861101

Call	Type	City	State	Frequency	Grid	Updated
WB8ZTV	DIGIPEATER	MOUNDSVILLE	WV	145.0100		851112
WA9ABB	DIGIPEATER	COLORADO SPRINGS	CO	145.0100		861018
KA9AKM	DIGIPEATER	EDWARDSVILLE	IL	145.0100		850926
WB9ANO	PBBS	ENON	OH	145.0100		861130
N9ATM-2	DIGIPEATER	CHICAGO	IL	144.9500		850926
K9AWX	PBBS	CHICAGO	IL	145.0100		861130
W9AZ	DIGIPEATER	KANKAKEE	IL	145.0100		870324
N9BAC	PBBS	FORT WAYNE	IN	145.0100		861130
N9CAI-1	DIGIPEATER	DAVENPORT	IA	145.0100		870324
KA9CAP	DIGIPEATER	URBANA	IL	145.0100		870103
KD9CC-1	DIGIPEATER	VALPARAISO	IN	145.0700		870324
N9CLE-1	DIGIPEATER	TOMAHAWK	WI	145.0100		850926
WB9CNE	PBBS	INDIANAPOLIS	IN	145.0100		861130
K9CW-1	DIGIPEATER	URBANA	IL	145.0100		870324
K9CYW-1	DIGIPEATER	GRIDLEY	IL	147.5550		870317
K9CYW-2	DIGIPEATER	GRIDLEY	IL	147.0100		870317
NI9D	PBBS	BROOKFIELD	WI	14.1070		860204
NI9D	PBBS	BROOKFIELD	WI	145.0100		850204
KM9D-1	PBBS	WEST LAFAYETTE	IN	145.0100		870324
N9DAN	DIGIPEATER	GREENVILLE	IL	145.0100		850926
WD9DHI	PBBS	CEDERBERG	WI	14.1090		870103
WD9DHI	PBBS	CEDERBERG	WI	145.0100		861130
KB9DU	DIGIPEATER	FILLMORE	IL	145.0100		850926
WB9EEA-1	DIGIPEATER	DUNDEE	IL	145.0100		851112
WD9EYB-1	PBBS	WEST TERRE HAUTE	IN	145.0100		850926
WA9FIO	DIGIPEATER	LACROSSE	WI	145.0100		870324
WA9GKA	DIGIPEATER	OTIS	IN	145.0100		850926
K9HHO	PBBS	GOODFIELD	IL	145.0100		870324
K9HHO	PBBS	GOODFIELD	IL	147.5550		870324
N9IF	DIGIPEATER	MADISON	WI	145.0100		850926
WA9INM-1	DIGIPEATER	PLYMOUTH	WI	145.0100		870324
K9JA	PBBS	URBANA	IL	145.0100		870324
KB9JD	PBBS	TERRE HAUTE	IN	145.0100		870324
KA9JQX-1	DIGIPEATER	ROCKFORD	IL	145.0100		850926
K9JRI	PBBS	INDIANAPOLIS	IN	145.0100		860204
KA9JXQ-1	DIGIPEATER	ANDERSON	IN	145.0100		850926
WA9KEC	PBBS	NORTH PRAIRIE	WI	145.0100		870324
WA9KEC	PBBS	NORTH PRAIRIE	WI	145.0900		870324
W9KXO	DIGIPEATER	GREENVILLE	IL	145.0100		850926
KJ9L	PBBS	SKOKIE	IL	145.0100		870324
W9LCK-1	DIGIPEATER	ELGIN	IL	145.0900		870324
KD9LP-1	PBBS	PERU	IN	145.0100		861130
K9LSB-1	DIGIPEATER	FORT WAYNE	IN	145.0100		850926
W9LZQ-1	PBBS	LACROSSE	WI	145.0100		870324
KA9MFN	PBBS	GALESBURG	IL	145.0100		850926
WB9MJN	PBBS	NAPERVILLE	IL	145.0100		861130
WB9OWN	PBBS	NORTH PRAIRIE	WI	14.1070		870324
WB9OWN	PBBS	NORTH PRAIRIE	WI	145.0100		870324
KD9PU	PBBS	ELSMERE	KY	145.0100		870301
KA9Q	PBBS	WARREN	NJ	145.0100		850630
WB9QPG-1	DIGIPEATER	GREENHIL	IN	147.5550		650926
WB9RNW-2	DIGIPEATER	THOUSAND OAKS	CA	145.0900		861201
WB9RNW-3	DIGIPEATER	MT. WILSON	CA	145.0900		861201
WB9SDA	DIGIPEATER	FOND DU LAC	WI	145.0100		850926
WA9SOU-2	DIGIPEATER	NORTH FREEDOM	WI	145.0100		851112
WB9TYT-9	DIGIPEATER	SLINGER	WI	145.0900		870324
WA9UGO-1	DIGIPEATER	MARTINSVILLE	IL	145.0100		870324
WA9UKK	DIGIPEATER	WEST TERRE HAUTE	IN	145.0100		850926
WA9UXP	PBBS	VALPARAISO	IN	145.0100		870324
WA9UXP	PBBS	VALPARAISO	IN	145.0700		870324
AG9V	PBBS	GREEN BAY	WI	145.0100		870324
WB9WBN	DIGIPEATER	CHICAGO	IL	144.9500		670324
W9WI-1	PBBS	MADISON	WI	145.0100		870324
WA9WOS	PBBS	ANDERSON	IN	145.0100		861130
WB9WRW	DIGIPEATER	HUBERTUS	WI	145.0100		870324
WB9YLR	DIGIPEATER	LINDENHURST	IL	145.0100		851112
W9ZBD	PBBS	RHINELANDER	WI	145.0100		870324
W9ZGS	DIGIPEATER	DUNDEE	IL	145.0300		870324
W9ZRX	PBBS	WESTFIELD	IN	14.1090		870103
W9ZRX	PBBS	WESTFIELD	IN	145.0100		870310

nications. These should work very well with the IBM and compatibles and will probably allow you to run 1200 baud. Lines 1000-1020 is the routine to send responses out the RS-232 port.

The TERMINAL portion of this program, lines 10000-11040, are for convenience and can be removed. I used almost the same routine found in the back of the TNC manual. As you can see, the extra lines in this portion of the program are used to program the TNC and get back up to the Robot mode, etc.

SCROLL protection is done in line 1510, with a POKE 2964,4 and removed in line 4090, with a POKE 2964,0 when exiting the program. This is used only for the Model-IV user running TRSDOS 6.2 or TRSDOS 6.3 (LSDOS 6.3). If you are using TRSDOS 6.1, POKE 3013. If you choose not to use the PRINT AT statements then, don't use scroll protection.

I tried this program running under Model-III mode in my Model IV. It runs at the fast speed under LDOS, but misses letters when slowed down to regular Model-III speed. Maybe you can come up with a little faster routine on your Model III.

"If you have enough data statements and natural responses, you may even fool the other operator into thinking that he is talking to some human on the other end."

I have included the OUT statements in line 150 for this computer. Remove the REM from 150 and delete line 160. You will also have to change variables with more than two letters to two-letter variables.

If you have a cassette model, you could put the data files into data statements and eliminate the disk files. Even the CALLSIGN & NAME file could be put into data statements.

Finis

In the future, you might want to change the program to take messages or to leave messages for a friend from whom you are expecting a call, or maybe to work contest. As I don't work contest, I don't know if this would be legal or not, so it would be best to check the contest rules of the contest you are planning to enter. This program could be adapted to use on RTTY or CW with some modification. It could even be used on a telephone modem by checking modem status for a connect.

I hope you have as much fun using this program as I have had writing it. If you ever connect to KE5L you may be talking to TRON instead of me. 73's. ■

W. C. Cloninger, Jr. K3OF
4409 Buckthorn Ct.
Rockville MD 20853

EZ PCBs

Printed circuit boards from a photocopier. . . well, almost!

Positive resists, negative resists, developers, sprays. . .you can forget about those and make your own printed circuit boards (PCBs) with a minimum of skill, effort, and cost. Thanks to a relatively new product—TEC-200™ film—there is no reason to wait any longer to make your own PCBs.

I am a fairly avid project builder and have hard-wired perfboards for many of my projects. I had resisted making my own PCBs because the methods I had read about seemed to require more time and effort than I wished to invest, or seemed a little too complicated. I noticed an ad for TEC-200 film, requested, and promptly received information from the supplier (The Meadowlake Corp., 25 Blanchard Dr., PO Box 497, Northport NY 11768) about the product. The process sounded so simple and appealing that I ordered 10 sheets of the film.

"I had resisted making my own PCBs because the methods I had read about seemed to require more time and effort than I wished to invest."

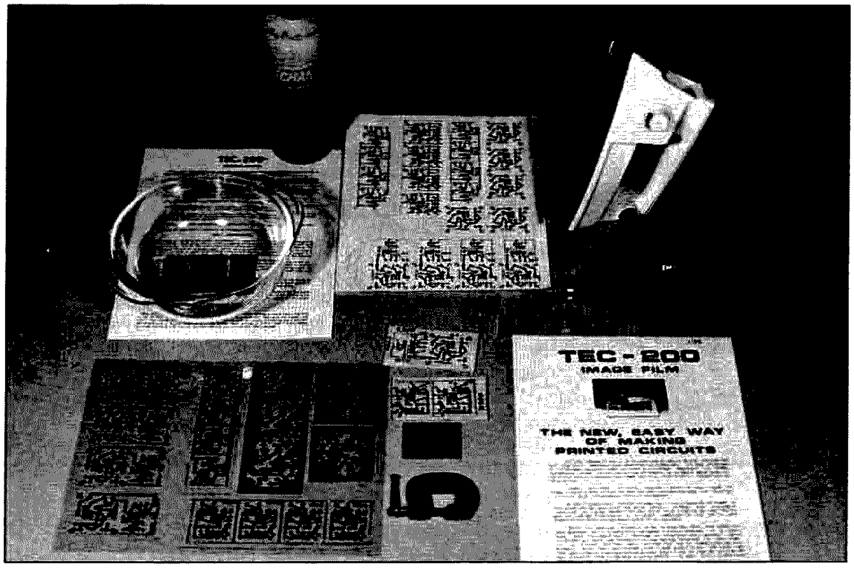

Photo A. A minimum of materials are needed to fabricate your own printed circuit boards. At the lower left is a completely filled sheet of TEC-200 film ready for transfer to copperclad board.

The Process

Everything you need, except the copier, is shown in Photo A. The basic process is:

1. Photocopy the circuit pattern onto the TEC-200 film. (The film is placed in the paper tray of the photocopier.)
2. Transfer the circuit pattern from the TEC-200 to a copperclad board using an electric iron.
3. Etch the board, using any common etchant.
4. Cut and drill to finish the printed circuit board.

The Printed Circuit

Most magazine project articles include a full-size circuit pattern, but this can't always be counted on. However, you may make your own circuit patterns. There are special drafting products such as DATAK™ dry transfers to make your design look professional. I started, however, by drawing the circuit design on graph paper (.1" squares) using a felt-tipped pen and exercising care to complete all lines and make no unwanted overlaps. I photocopied the design to regular paper using a photocopier that is "blind" to the process blue of the graph paper. I then "cut and pasted" to fill up a full sheet of paper with desired circuit patterns. I quite often want more than just one PCB of the same circuit.

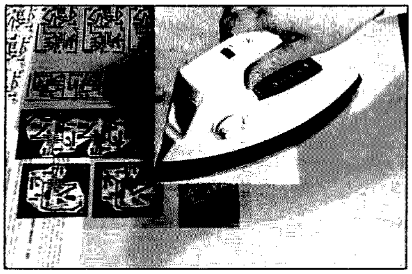

Photo B. An iron set for cotton (265°F to 295°F) is used to transfer the circuit design from the TEC-200 film to the copperclad board.

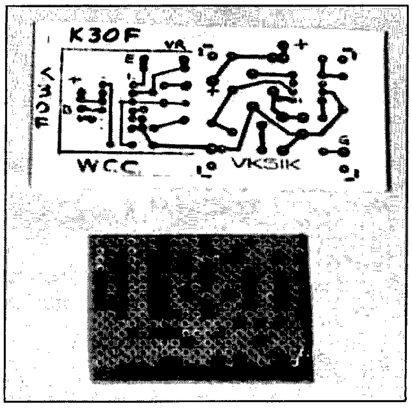

Photo C. Etched PC board with perfboard drilling template in the foreground.

Execution

You will probably need a mirror image of the circuit patterns for the actual etching pattern. To obtain this mirror image, first photocopy the design to a sheet of TEC-200 film. Turn over this copy and back it with a clean piece of paper, and photocopy this onto another sheet of the film. This second copy is the one you will transfer directly to the cop-

Photo D. Don't drill your finger! Place PC board with template on a suitable surface before drilling. The small drill bits are easy to break, so take your time.

perclad board. The intermediate copy may be saved and reused by removing the toner with an organic solvent such as acetone, lacquer thinner, or Trichloroethane (Energine or Ford Spot Remover).

Next, transfer the circuit pattern to the copperclad board (Photo B). I used a piece of cloth between the iron and the TEC-200 film. I found that it requires about one minute to make a complete transfer pattern. I never experienced any problem with too much pressure or too much time for the transfer, but I *did* experience difficulty with too little of either. I used a resist

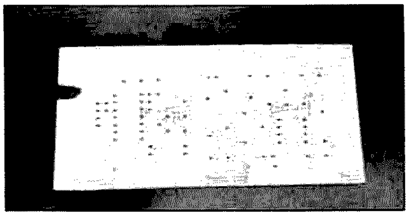

Photo E. Top of drilled PC board showing accurate hole pattern when using perfboard template.

pen to touch up any questionable parts of the pattern.

The board is now etched using any common etchant. I used ferric chloride, available from Radio Shack. The etchant instructions indicated a time of 15–20 minutes, but I found that my boards require about an hour of continuous agitation for complete removal of all unwanted copper. My next project. . .a motorized agitator! Keeping the etchant warm also hastens the process.

Completion

After washing and drying, the PCB is ready for completion. Drilling the holes in the PCB need not be a difficult task. I marked a perfboard (Photo C) for use as a drilling template. Although you cannot tell from the black-and-white photograph, there are actually two template patterns marked on the same perfboard. They are simply marked in two different col-

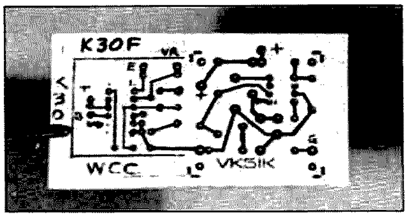

Photo F. Finished, ready-to-use PC board.

ors. The template is carefully positioned and clamped to the etched board. I used a .043" (#57 wire guage) PC drill bit with a 1/8" shank in a rotary tool and the template made accurate drilling a breeze (Photo D). You can buy reconditioned PC drill bits from Jameco Electronics (1355 Shoreway Road, Belmont CA 94002) and carbide bits from Hal-tronix, Inc., (12671 Dix Toledo Highway, PO Box 1101, Southgate MI 48195). The top side of the PCB (Photo E) shows the uniform, properly aligned holes for easy installation of DIP sockets and other components. You may want to tin-plate the PCB using a chemical dip. A tinning kit—TINNIT™—can be obtained from the DATAK Corporation (65-71st Street, Guttenberg NJ 07093).

The PCB is now ready for component installation. The actual circuit shown (Photo F) is a "crowbar" circuit from a magazine article, married to a voltage regulator drawn as described above.

No more perfboard projects for me! ■

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IC-2AT Packet Interface

Use WB5WSV's external PTT circuit to get on packet with an IC-2AT and an MFJ-1270.

I have been using the MFJ-1270 TAPR TNC-2 clone for about three months and have been very pleased with the unit's performance. I connected the MFJ-1270 to my Atari 520ST and old ICOM IC-215 and experienced no interfacing problems; I didn't even have to mess with my TNC's output levels. However, I was more eager to use my more modern, synthesized ICOM IC-2AT in order to expand the frequencies on which I could work packet. This effort became an imperative when the 145.01 transmit crystal in the IC-215 died.

Trying to interface the IC-2AT to the MFJ-1270 presented a problem. The TNC has a typical transceiver-type PTT connection which grounds the PTT line to transmit. The IC-2AT has no separate PTT line for the external mike; it performs T/R switching by sensing the impedance change when the mike is switched on, as shown in Fig. 1.

Experimentation showed that the IC-2AT would not key up when connected directly to the TNC, even when a data signal was present. I also found that the IC-2AT needed about 30k or less of resistance across the mike input to key up.

The solution to the problem was the circuit shown in Fig. 2. The PTT signal from the TNC causes the relay, K1, to close, and the potentiometer, R1, is set at a value low enough to cause the transceiver to key up. Some experimentation will be needed to find the proper setting of R1. Too low a setting will short out the output of the TNC; too high a setting will prevent the transmitter from keying up reliably. For my rig, I found that 30k worked best. The speaker is optional, but I've found that it helps to be able to monitor signals audibly.

The circuit is about as simple as they get. Use a relay which has a relatively low coil current requirement so as not to make extreme demands on the power MOSFET in the TNC. The relay I use, a Radio Shack 275-227, pulls about 60 mA. I cannot recommend magnetic-reed relays (such as the Radio Shack 275-233) because they are too sensitive to rf. In fact, RFI proved to be quite a problem in any case. With an antenna plugged directly into the IC-2AT connector, transmitting caused the system to lock up after the PTT signal was removed. This was corrected by using an rf-tight box, placing ferrite beads on the audio and power lines, and operating on the transmitter low-power setting. If your system still locks up, I suggest mounting the antenna some distance from the rig.

After you've got the interface box built and hooked up, set the TNC transmit delay (TXDELAY) to a value that will give transceiver time to key up. I found a TXDELAY value of 50—equal to 50 ms—worked fine. Then find a setting of R1 which will suffice: start out with about 10k and adjust. Finally, set the output level of the TNC to that required to give a good modulation level, using the instructions in the MFJ manual. ■

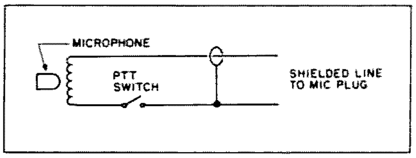

Fig. 1. IC-2AT switching.

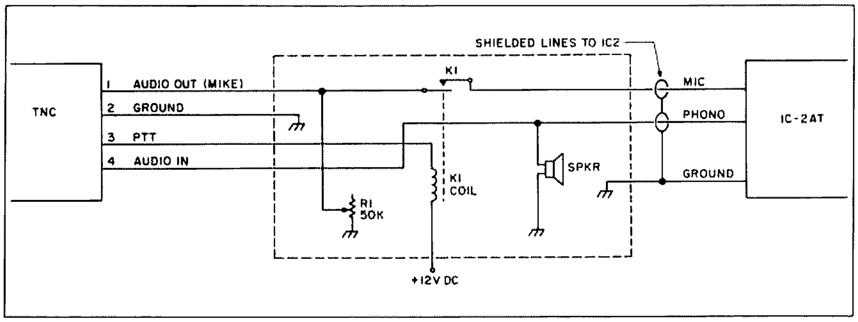

Fig. 2. Interface circuit.

NK6K > PACKET

Harold Price NK6K
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GETTING OLD

I passed my 31st birthday the other day, which is undeniably over 30. The music I grew up with is now only played on "classic rock" stations, just one step removed from "golden oldies". I saw an interview with the new crew of "Star Trek, the Next Generation", a bunch of geeks not fit to pilot Captain Kirk's shuttle craft. I recently gave a packet talk to some high school kids who hadn't been born when I got my first ham ticket. My life is over.

Still, it could be worse. I was at a dinner party the other night where I was subjected to a lot of hooey by some senior types about how "kids today" (meaning me) didn't know what it was like to have to work for a living. I heard interminable stories about how they used to earn $100 a week and had to do more than watch a computer do the work for them.

Since these were people my wife works with, I avoided pointing out that back when they were making $100 a week, they could buy twice the house and 5 times the land outright for the 20 percent down payment on my 1270-square-foot house and 50 X 100 foot lot. I didn't mention the 5 1/4 percent mortgage they got, or that my regular American car cost 5 times what theirs did and will last half as long. Or that they used up all the cheap gas. They paid 20 cents a gallon—my first gallon was 60 cents. Grumble.

Anyway, I'm going to do my bit to address the generation gap issue. I'm not worrying about anyone over 31, by the way—I didn't trust anyone over 30 when I was under 30 and I see no reason to start now. Roy Neal K6DUE, and a camera crew are coming over tomorrow to shoot some "World of Amateur Radio"-style packet scenes for a documentary on amateur radio. Not that I was their first choice, mind you. It seems that some old guy stood them up. I'm going to stick pictures of Wayne (you know, the ones with the bulls' eyes) over most of the equipment I've accumulated over the years and try to show just the minimum needed to enter the amateur hobby from the digital side. I haven't seen too many new novices bouncing through the packet network yet; hopefully, this is just due to a lack of gateways with inputs in the new novice portion of the bands. See what your club can do to support a novice access port. One day one of those kids is going to make a starting salary several times what your current salary is—maybe he'll buy a keg for Field Day 1997.

I know the transition to the next section is weak, but I'm cleaning for the camera crew tomorrow. To top things off, the Letterman show is a rerun, and I've lost the will to live. You'll just have to take this transition cold turkey.

"To top things off, the Letterman show is a rerun, and I've lost the will to live."

HF STA

Speaking of old things, the request to the FCC for a Special Temporary Authorization (STA) to run a 24-hour, fully-automated, and unattended packet on HF has finally been submitted. This has been "in committee" for more than a year, as various groups inside and outside the ARRL argued over the scope, duration, and number of participants.

An amateur radio STA is something you ask for when you want to do an experiment that is within the basic definition of amateur radio but outside the letter of the current law. Several of the specialized modes in use on the amateur bands now saw their first use by a few hams running under an STA. Sometimes new amateur bands are warmed up by an expeditionary force doing propagation experiments under an STA. The new WARC bands (10 MHz, 18 MHz, and 24 MHz) had such an STA. The usual goal of an STA group is to report the results of the experi-

"The American Radio Relay League (the nonprofit, educational and scientific organization representing the interests of more than 400,000 licensed radio amateurs in the U.S.) respectfully requests that the Commission grant special temporary authority to permit experimentation, as detailed below. This application is made on behalf of, and with the consent of, the individuals named herein (see column). These individuals volunteered to be part of this STA, which was prepared without reference to whether or not these individuals are League members.

1. Names and Addresses of the Applicants. The names and addresses of the applicants are given in the attached letters of participation.
2. Description of Special Need. Temporary authority is required to permit unattended automatic operation of amateur stations using packet radio below 50 MHz. Specific waiver of section 97.80 of the Commission's rules is needed to permit unattended operation under automatic control while transmitting third-party traffic on frequencies below 50 MHz.
3. Type of Operations. Operations will involve packet-switched transfer of messages between unattended amateur stations operating under automatic control on HF.

a. Purpose: The amateur stations participating in the STA will function as relay stations in a long-haul HF net called SKIPNET which connects at the end points with the existing and rapidly growing VHF amateur packet-radio network. The VHF packet network is presently capable of only local and regional message forwarding up to about 150 miles reliably and up to about 300 miles at the extreme. SKIPNET will provide the long-distance links needed to effect an amateur packet-radio message-transfer capability throughout the United States, thus significantly enhancing the amateurs' emergency-communications capabilities.

b. Objectives: The objectives of this request for STA are:
(1) to prove the concept of unattended automatic control of HF packet-radio stations;
(2) to demonstrate experimentally that such operation can be conducted without: (a) harmful interference to other users; (b) malfunction of transmitters such that they deny others the use of the operating frequency; and, (c) transmission of improper communications without timely corrective action.
(3) to determine the design and responsible management of a nationwide network of stations conducting such operations.
(4) to gather information necessary for drafting of a petition for a permanent rule change to permit unattended automatic control of HF packet-radio stations.

4. Dates and Times of Operation. The applicants request that operation under the STA commence immediately upon the granting of authority by the Commission, and that such authority be permitted for six months. The operations are to be on a 24-hour basis during the STA period.
5. Class of Stations and Radio Service. All stations are licensed in the amateur service, and all hold a minimum of a General class license.
6. Location. Locations of the stations are given in the individual letters of participation, attached.
7. Number of Transmitters. No waiver of amateur rules is required.
8. Operating Frequencies. The operating frequencies are listed below. These listed frequencies designate the center frequencies of the channels. It is our intention that the frequencies listed will be used, but we wish to retain the flexibility of changing a few kHz in order to avoid interference. One or more of these frequencies will be in use at any one time, according to diurnal propagational needs: 3607.3, 7091.3, 10147.3(•), and 14108.3 kHz (•Band edge of 10150 kHz to be respected at all times).
9. Output Power of Transmitters. The transmitter output power shall not exceed 200 watts.
10. Type of Emission. J2D and F1D emissions are to be used.
11. Description of Antenna. A variety of antennas will be used. No special waiver of the rules is requested."

ment to the FCC, and then petition for a rules change that would make whatever they were doing under the STA part of Part 97 and legal for any amateur.

Such is the case with the current STA. Its purpose is to run an experiment and gather data on unattended, automated HF packet operation. Hopefully, the final report will show that such operation is a benefit to the amateur community and the general public in times of emergency, that it does not cause undue hardship on current users of the band, and that it does not damage the ionosphere. With hard facts in hand, we will be in a stronger position to petition the FCC to permit regular automated unattended operation on HF as a regular part of the amateur regs. The STA will also provide a focus on related issues. For example, the sort of operation the STA will allow is something that has not been popular in some corners in the past, i.e., a net that is always in session. The packet style of channel-sharing is starting to occur, but the sharing now is only with other packet users. As practice has shown over the past several years, channel-sharing between voice-users and data-users seldom works to anyone's advantage, even if the packet station is attended. Where a packet net differs from older types of "perpetual nets" is that liter- ally thousands of hams are be- ing served by the HF-packet network. This service should more than make up for the removal of "the packet frequency(ies)" from the pool of old-style QSO frequencies.

The purpose of the STA is not to show that no one will be displaced, or that an automated HF network fits in the current international bandplans. As with anything new, the old must be juggled around a bit to make room.

Part of the purpose of the proposed STA is to document the number of messages and the number of to/from address pairs serviced by the STA network. The STA should generate usable results, since most of the participants come from the ranks of the current "14.109" network (see the January 87 column).

The text of the STA requested by the ARRL is reproduced in the sidebar, minus some legal boilerplate.

Uplinked by GB2UP
FTO:W0RLI @ NK6K ! W0RLI FDE:G8UFQ @ GB3UP ! G8UFQ

Msg#	MMDD	UTC	T Size	TO	@	BBS FROM	TITLE
1328	0614	0632	781	DCE	GB3UP	G8UFQ	

Time.H For W0RLI "C" source (Help!!)
R:870614 0430 @ G1AWD G8UFO #1587 (Reading IO91LI [TVPRG BBS]
R:870614/0304 @ G4MTP #1457 (DAVENTRY BBS)
R:870614 0222 @ G1DIL #2265 (Wolverhampton) [Maxpak BBS]
R:870614 0140 @ GB3CD #1659 (Cheshire IO83TF)
R:870613 1143 @ G4CLI #333 (Wakefield) [IO93FP]
R:870613 1131 @ G8UFQ #237 (Grimsby) [IO93XN]
W0RLI @ W0RLI

Hi. You should have received a letter explaining my interest in your "C" source for the BBS code. Could you please tell me where I can get hold of the TIME.H file that you use when compiling. I am most interested in playing with the code as I am a newcomer to "C" and it is an ideal opportunity to try and learn it. Many thanks. Graham G8UFQ @ G8UFQ via GB3UP

Fig 1. Message from G8UFQ to WORLI via the UO11 DCE.

UO11 DCE

A quickie to finish up this month: the UO11 DCE is now seeing regular use as a mail gateway between the UK, the US, and Australia. GB2UP at the University of Surrey is the satellite uplink in the UK, and GB3UP is the local BBS. VK5AGR is the gateway in Australia; NK6K and K1KSY are handling the task in the U.S. Figure 1 shows one of the first messages to come through via GB2UP for forwarding via NK6K.

See you next month. ■

HAMSATS

Andy MacAllister
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Pearland TX 77581

WHERE IS PHASE 3 C?

Even though satellite activity has been on the upswing since AMSAT-OSCAR-10's return to the air, we can't help wondering about A-O-10's replacement. While still exciting, A-O-10 is not the satellite it once was.

There is a lack of telemetry on the general beacon frequency, and the attitude of the spacecraft is obviously uncontrollable.

So when will Phase 3 C graduate to OSCAR status?

It's been over a year since Phase 3 C, accompanied by three trunks of parts, tools and gear, was delivered to Continental Air Cargo at Denver's Stapleton Airport for its journey to Houston and Frankfurt, Germany. After 12 months of construction and testing by the Colorado team of AMSAT satellite builders, the nearly completed spaceframe was sent to the group at AMSAT-DL (Germany) to be finished.

Today Phase 3 C awaits word on the much-delayed launch schedule of the European Space Agency. It is still in West Germany undergoing some final upgrades, including the new, radiation-hardened memory circuits donated by the Harris Corporation. The addition of these new memory ICs should allow the satellite to survive the rigors of space radiation far better than its predecessor, A-O-10.

Once a launch date is set for Ariane mission V-21, Phase 3 C will be readied for lift-off.

When will this happen? AMSAT anticipates an early 1988 launch, although all could be ready if a launch came as soon as this autumn.

The many delays in the European Space Agency launch schedule have been blamed on problems with the HM7-B third-stage engine built by SEP of France.

In May of last year, the V-18 mission was lost due to an ignition malfunction in the third-stage engine. Earlier this year, after the engine ignitors were redesigned, the HM7-B for the V-19 mission was damaged in the SEP vacuum chamber testing facility.

Now the engine from the V-20 mission, brought in to replace the damaged V-19 motor, is having problems with the turbopump bearing system. Hundreds of millions of dollars worth of satellites are waiting for their turn to fly. Phase 3 C will be one of four payloads on the first Ariane 4 vehicle. We all hope for a successful lift-off soon.

What can Phase 3 C do that A-O-10 cannot? (Note the preliminary frequency plan for Phase 3 C in Figure 1.) A-O-10 was primarily a Mode B satellite (70 cm up and 2 m down). Phase 3 C offers three prominent improvements in addition to the standard Mode-B transponder and functional Mode-L system (23 cm up and 70 cm down).

The first new item seen in the figure is Mode JL. This will allow simultaneous J (2 m up and 70 cm down) and L activity. Note that the Mode-J transponder is a subset of the Mode-L downlink. The Mode L transponder is 250-kHz wide with a 40-kHz wide Mode J within it. This will allow those with 1.2- GHz equipment (Novices?) to communicate with hams using 2 m for their uplink, assuming both have the necessary 435-MHz rigs for reception.

Another important addition found on Phase 3 C is the Mode- S transponder with a 70-cm uplink and a 13-cm downlink. At first, the 2.4-GHz downlink may seem rather foreboding, but I would be surprised if simple construction articles and kits don't show up soon. Four-foot homemade dishes with single-board receive converters should become quite common.

Many innovative hams and experimenters have been building 2.1-GHz TV converters for years. The article, "You Can Watch Those Secret TV Channels" by K0JB and K0FQA in the August 1979 issue of *73*, demonstrates one of the earlier, yet functional, home-brew projects dealing with microwave receive converters.

The Mode-S transponder is quite narrow (20 to 30 kHz), but should be capable of supporting at least four SSB QSOs with no problem. During final tests around June 1986, the measured power output was 1.25 Watts. This was for nearly 700 continuous hours. The overall transponder efficiency is about 17 percent. Mode S represents the highest frequency yet for a hamsat transponder.

Phase 3C

Estimated Launch Date: Early 1988
(PRELIMINARY ESTIMATES)
As of April 1987

Summary: Mode B: 70 cm up; 2 meters down Mode JL: 24 cm and 2 meters up; 70 cm down Mode S: 70 cm up; 13 cm down RUDAK: 24 cm up; 70 cm down Beacons: Mode B: General Beacon 145.8125; Engineering Beacon 145.975 Mode JL: General Beacon 435.650; Engineering Beacon 435.675 Mode S: 2400.640

Mode B:	Uplink (MHz)	Downlink (MHz)	
		145.975	Engineering Beacon
	435.425	145.975	Passband limit, upper
	435.435	145.965	
	435.445	145.955	
	435.455	145.945	
	435.465	145.935	
	435.475	145.925	
	435.485	145.915	
	435.495	145.905	
	435.505	145.895	Passband center
	435.515	145.885	
	435.525	145.875	
	435.535	145.865	
	435.545	145.855	
	435.555	145.845	
	435.565	145.835	
	435.575	145.825	Passband limit, lower
		145.8125	General Beacon

Mode JL:

L Uplink	J1 Uplink	Downlink	J2 Uplink	
1269.325		435.975		L Passband limit, upper
1269.330	145.820	435.970	144.440	J Sub-band limit, upper
1269.340	145.830	435.960	144.450	
1269.350	145.840	435.950	144.460	J Sub-band center
1269.360	145.850	435.940	144.470	
1269.370	145.860	435.930	144.480	J Sub-band limit, lower
1269.380		435.920		
1269.390		435.910		
1269.400		435.900		
1269.410		435.890		
1269.420		435.880		
1269.430		435.870		
1269.440		435.860		
1269.450		435.850		L Passband Center
1269.460		435.840		
1269.470		435.830		
1269.480		435.820		
1269.490		435.810		
1269.500		435.800		
1269.510		435.790		
1269.520		435.780		
1269.530		435.770		
1269.540		435.760		
1269.550		435.750		
1269.560		435.740		
1269.570		435.730		
1269.575		435.725		L Passband limit, lower
		435.675		Engineering Beacon
		435.650		General Beacon

Mode S:	Uplink	Downlink	
		2400.640	Beacon
	435.610	2400.695	Passband limit, lower
	435.615	2400.700	
	435.620	2400.705	
	435.625	2400.710	Passband center
	435.630	2400.715	
	435.635	2400.720	
	435.640	2400.725	Passband limit, lower
RUDAK:	1269.675	435.675	Single channel

Source: AMSAT DL, DJ5KQ, DJ0HC/KE6MN, K0RZ

Fig. 1.

The final item noted in Figure 1 is RUDAK. This stands for Regenerativer Umsetzer fur Digital Amateur Kommunikation, or Amateur Radio Digipeater. It will be AX.25

Continued on p. 60

NEVER SAY DIE

from page 10

make DX contacts in "his" CW band.

Then came sideband, which kind of snuck up on the old-timer AMers—starting on the high end of 20m, where only the lowest of low would even listen. Sideband started at one end of the band and swept down until it forced the AMers, kicking and screaming, off the low end.

By the mid-60s AM was about gone, with just a few hold-outs like W2OY doing their best to make life miserable for as many of us as possible.

It was a desire to go back to the good old days of the privileged ham—the old Class A ham—which brought on Incentive Licensing in 1963. The 3995 group of AM old-timers had moved to 3999 with their private club. FCC Commissioner Sterling (a ham) had made a mess of things as far as the old-timers were concerned with his damned Novice, Technician, General, and Extra crap. The ARRL proposal which blew our whole hobby to bits was essentially designed to undo George Sterling's changes and put things back the way they were before WWII.

We had a little excursion in the early 70s when FM and repeaters came along, but that didn't change the low bands—which are pretty much the way they were almost 30 years ago.

Lacking the youngsters to invent and pioneer new communications modes, I guess we'll be using sideband from now until we lose the rest of our bands to commercial interests. We've moved in about 20-year spurts in the past—spark 1900–1920, CW 1920–1940, AM 1940–1960, SSB 1960–? That's about it, eh?

Conversation

There are a few troublemakers who have been caviling about what they feel is the dreadful intellectual void on our bands. They've been bitching about our sticking to making our contacts boring beyond belief. I think it's time to speak up for the average ham and show up these intellectual snobs.

If you've done any hamming recently, you know as well as I that with few exceptions there's nothing even remotely approaching a clear channel. We're still stuck with our 1950s horribly antiquated sideband technology which assures us of QRM-packed contacts. When you're hearing only about 10% of what a chap is saying to you, you have to know what he's saying before he says it. Further, it's very helpful to be able to make a contact with nothing whatever heard beyond the call. . . and that's what we've got.

If the handle comes through, that's a plus—probably because the chap has spelled it out several times and you've managed to get a letter here and there, then pieced the parts together in what looks like a name (checked in the Callbook, *just in case). But without the name, "old man" is just fine.*

The main thing is to be able to sense when the other chap has stopped sending so you can come back. That's the tough part. Usually you can just make out his voice in the bedlam and go back, thanking him for the information on his rig, his antenna, his location and his weather and your report (put 5-9 in your log—you can't go wrong with that). Assure him that you're filling out his QSL now and thank him for offering to send his—give him his 5-9 report "with a little QRM" and turn it back.

This is our normal ham contact and it's ideally suited to our communications system. Beyond the call, nothing further has to really be communicated.

In case of one of those rare contacts where the other chap is banging in and swamping the others on the channel, instead of dozing off you can keep up a lively conversation with whoever is in the shack with you—or, better yet, read *73*. I used to get most of my construction projects built while making contacts. I developed a sort of sixth-sense which would alert me when the other chap would turn it back. These days I have my little computer in my lap to answer my mail and write editorials.

Have you ever tried to think of something interesting to say during a contact? Most ham minds come up with a total blank on that one, so they do like me and repeat the usual ritual—something that comes automatically and requires no thought whatever. Hey, we don't want to use up the mind, do we? Better to save it for some more important use.

Now and then I've suggested shortening our contacts so we might have less QRM. I wonder if a Contact Book—a book with the essential information from each active amateur which could be looked up after a contact has been consummated—might be a good project? Then all we'd have to get through would be the call letters. From there on we'd look up the contact in The Contact Book which would give us the name, town, rig, antenna, and perhaps even a paragraph of two of non-essential information. All reports would be, as now, 5-9. Yes, yes, I know—you're worried about the weather information. I have an answer for that, too. On the back cover of the book we'll have a weather spinner. When you look up the contact you spin it and find out whether he has rain, snow, cold, hot, or whatever.

"Incentive Licensing, which blew our whole hobby to bits, was essentially designed to undo George Sterling's changes and put things back the way they were before WWII."

But what, you ask, if the chap changes his antenna? Hey, we'll bring out a new, updated edition of the book every ten years, so where's the problem?

I remember a few years ago when I used to ask my contacts what they did. For the last few years everyone I've contacted has been retired, so we don't even have to put that in the book. Hamming is a great hobby for those with unlimited time to do nothing of any value whatever—almost as good as playing golf, which has been described as a way of needlessly extending useless lives.

Cheers.

HOW TO USE THE TELEPHONE

Almost everyone I see using the telephone in any kind of noisy environment tries to cope with the problem the same way: They stick their index finger in the other ear to block out the noise. This may be helpful in digging the wax out of the unused ear, but it's of no use in making it easier to hear. I guess they don't teach much about ears in school these days.

If you use the right technique, you'll be able to hear over the phone despite almost unbelievable background noise. You see, we have an incredible computer built into our head (big news flash!), one quite capable of separating the sounds from each ear, allowing you to put your attention on either, both, or none. This is called the cocktail party effect. Perhaps you've noticed, when you're in a room full of people, that even though there are a number of conversations going on around the room, you can selectively listen to any group you want.

The noise that's really bothering you when you're using the telephone isn't what's coming in the other ear, it's the noise being picked up by the telephone microphone and coming into the same ear you're trying to use to hear on the phone. Right, all you have to do is put your hand over the mike, not a finger in your ear. The brain will shut off the second ear for you with more efficiency than your finger—and the noise won't jam the incoming conversation.

Make sense? Now, go out and educate the world on how to use the telephone. It's a thankless job, but someone has to do it.

Vox Pop

Virtually every rig has a VOX circuit built in. Other than as a sales feature, I wonder why? I haven't heard anyone use a VOX in years. . . and thank heavens!

The voice on xmit (VOX) seemed like a good Idea. How great to be able to talk with someone almost as we do when we meet them in person. Two people can't, even in person, talk at once, so presumably a VOX circuit should enable us to have contacts that are more like talking in person. Alas, it doesn't work in practice.

There are several problems with the system. First, let's say your VOX works fine and your rig can go on and off the air without relays snapping and popping. Even so, every time you pause for a breath or a thought, your receiv-

er comes back on. Now, if the frequency is completely silent, this might not be a major problem, but when was the last time you heard a silent frequency on the low bands? No, every time the receiver comes on, you're subjected to noise. . . a lot of noise.

We'll do a lot to avoid the noise—such as draw out our words while we try to think of what to say next. We'll errr and ahhh to keep the damned rig from turning off until the brain gets into gear again.

Not every rig goes into the transmit mode silently. Then, with a VOX, you have a relay or two snapping after every pause for breath. Drives you crazy. Well, it sure drives you away from VOX.

Then there's the problem of not knowing if the chap has turned it over to you or is just catching a breath, in which case you'll double for a while. . . and then stop using your VOX.

When there's much QRM, VOX is useless anyway. We can make contacts through pretty heavy interference because our contacts are all identical. If we hear even a shred of the word "nine," we know it's a signal report of five by nine, which is what you get no matter how weak or how unintelligible your signal is. When we hear the letters Q, S, or L, we know he's promised to send a card and wants one of ours. The only touchy parts of a contact are the call and the name—everything else is cookie-cutter. The name is either Bob or Bill, anyway, so please give me your call again.

That's why no one uses VOX. So now explain to me why we're still paying for this artifact that has never been of much value and isn't even used now. Perhaps we should mention it to the manufacturers.

Yes, I agree it's handy to have a rig designed so it can be used for fast break-in on CW. I'm not going to stir up anything by wondering what percentage of us actually get on CW—and, of that minority, how many use fast break-in.

Now, while I'm discussing vestigial circuits, I would like you to turn your damned voice processor down. About the only time a voice processor will help is when you're trying to drown out a bigger signal in a pileup and could care less about intelligibility. It's not likely you'll be understood, considering the distortion, but the circuit will increase your average voice power and tend to wipe out everyone else on the channel.

You know full well that the speech processor distorts your voice, right? So why on earth are you using the damned thing? Turn it off! If your signal is too weak to get through without it, buy an amplifier or put up a better antenna; don't crank up the processor and garbage up the frequency.

Some hams have a very serious problem—they want to put out every lousy Watt they can, so they turn up their mike gain and the compressor, with the result that every sigh, gasp, and stomach rumble modulates the rig 100%—as does every background noise in the shack—kids yelling and running around, the wife screaming at 'em. Give me a break.

Yes, I know there's a paranoid feeling that if the output meter doesn't stay up around 800 Watts no one will be able to hear you. I remember one time I was talking with a chap in Tokyo on 20m and my final dropped dead. I apprehensively called to see if I could get through with my driver and let him know what had happened. He came right back and said the drop in my signal wasn't really noticeable. I carried on the contact, feeling weak and vulnerable, expecting at any moment to lose him.

Tell you what, give me a hand (well, voice) asking chaps with their gain and compressors set too high to back off so we can hear what they actually sound like. This will also narrow their signal, allowing someone else to get a word in edgewise.

Just one of us won't get anywhere with this. It's going to take some wearing down of the more serious offenders. They'll be madder 'n hell with the first few of us to ask them to turn things down, but even the worst of lousy operating can eventually be corrected if we are polite, but firm. The hard part is in not getting mad right back when they attack you for having the gall to suggest they're screwing up. Use the *illegitimi carborundum* approach —wear the bastards down.

RADAR JAMMING

The battle between motorists and moving tax units—also known as radar-bearing police cars—continues to escalate. Since they're mostly using 10.5 GHz, which almost amounts to sharing our 10.0–10.5-GHz ham band, perhaps we should keep up with what's been happening.

It all started years ago with the first police radar units. It didn't take long before Regency came out with a detector. Alas, it wasn't sensitive enough to be of any real value—which made it worse than nothing because impressionable motorists would invest in it and then drive along at speed, believing they were safe from police attack.

Two chaps from Drake decided to make a 10.5-GHz receiver sensitive enough to actually do the job. It worked gangbusters, so they formed Cincinnati Microwave and started making the Escort. This revolutionized the field—and made millions for the ex-Drake techies.

The earlier receivers had just been tuned detectors—and this included the Fuzzbusters, which thus gave minimal warning. I tried most of these as they came out. At one time I had six of 'em mounted in my van. Some were better than others, but none were very good.

The Escort was the first superheterodyne receiver. Turn in your ham ticket if you can't explain the difference and diagram how a superhet works—and why it is so much better.

As Escorts and a growing number of knock-offs proliferated, it was inevitable that the police would counter these detectors. Efforts by states to outlaw the detectors were knocked down by the courts, so the radar makers came up with a hand gun system which gave no warning. Bad news for speeders, right? Well, before you get too smug, remember that surveys show that over 90% of the cars on many highways exceed the 55-mph limit.

This police escalation has resulted in a brisk market for jamming transmitters. Oregon Microwave claims they've sold over 40,000 so far. A jamming transmitter can be set to transmit an audio tone which will be read by the police radar as a speed—you set the speed.

I read an article in a car magazine saying they tested 'em and none of these jamming transmitters actually work. Jammers are, of course, illegal.

For those of you who, like me, don't like to dawdle while driving, there actually is a radar jamming device which not only works, but is legal. Let's say I'm driving a Porsche 911c, which is designed to be quite safe at 160 mph. I'm on a straight highway at 2 a.m. and there's not another car within miles. Do you really think I'm going to endanger myself by driving at 55 mph? I'd likely fall asleep from boredom. This is a major cause of accidents, by the way.

Now I suppose you're anxious for me to publish the relatively simple circuit for this effective, legal radar jammer. Well, I don't see why I should, since I already published it several years ago in *73*—complete construction plans.

The unit is brilliant in design—invented by a radar design engineer. Here's how it works. A radar transmitter sends out a pulse and then listens for it to be reflected from things. Reflections from stationary objects are ignored, with the receiver designed to hear the audio tones generated by moving objects—the Doppler shift, it's called.

Different cars reflect different amounts—so a big truck or van with a flat front which reflects the radar signals well can be picked up at a much greater distance than a small sleek sports car. Okay, suppose we mount a high-gain antenna which is tuned to the radar frequency on a car. This will reflect back one whale of a signal compared to that reflected just by the car itself. It'll thus be picked up further away and the strength of the reflected signal from this tuned antenna will mask anything bouncing back from the car itself as it gets closer.

The next step is to see that this walloping reflected signal reads a low speed on the radar unit. By mixing a low audio frequency with the reflected signal, the police radar will indicate the speed of your choice. And all this is done with no transmitter—just a very effective passive reflector. Well, mostly passive, except for perhaps a 25 mph audio tone with which you're modulating the returned signal.

This won't help against police planes. You need a sun roof to avoid these. Nor will it help against unmarked police cars or police cars that come up behind you and clock you.

If any readers have had success in radar jamming I'd like to hear from them. Until then, I suspect that hitting the radar frequency closely enough to jam may be difficult. That's what I like about a semi-passive reflector—it just does a better job of reflecting than your car, plus a slight massaging of the signal.

By the way, if you're a law and order fanatic, maybe you'll start pressuring Congress to kill the 55-mph limit. Figures lie and liars figure—so before you start believ-

ing government reports that the speed limit has saved lives, better check it out. *Car & Driver* blew that baloney to smithereens, showing the bottom line to be more lives lost with the 55 limit than without it.

Well, how about all the gas savings. . . right? That was the original justification for the 55 law. Baloney again. We'd save more gas if we increased our tire pressures by a couple pounds than we save by driving slowly. It's a political ploy, pure and simple—it's wasting a lot of time for millions of people, providing a most welcome income for towns from fines and a bonanza for insurance firms in increased premiums.

The 55 limit may not bother you if you poke along in a rusty old Chevy, which is dangerous at anything over 40. But it irks me when I'm driving a high-performance car on clear roads. I've taken the trouble to train myself to handle cars on race tracks—to handle them in rain, ice, snow, mud, and so on. I've driven over 50,000 miles of car rallies under every imaginable road condition. It doesn't make a lot of sense to me to have to drive at 40 mph on a road just because some drivers are using cars that aren't safe beyond that—or haven't ever bothered to develop good driving skills.

Speed doesn't kill—lousy cars and lousy drivers kill. Even more often, drunk drivers kill. Sadly it's still macho to drink too much and to brag about it. So our kids, striving to be grown up, drink and get killed. The families grieve for their loss, but never give a thought to the role model they provided which led their kid to drink—and killed 'em. Every kid I've known who got killed while driving drunk had drinking parents.

My parents and grandparents smoked and drank. I was fortunate perhaps in not heeding social pressures as much as my peers. This might have been due to my interest in electronics and hamming, which gave me an ego outlet so I didn't have to try to look older—to be cool—by smoking and drinking.

Sure, I tried smoking—ugh, it was awful. I tried beer. . . ugh again. The peer pressures in the Navy were enough to get me drinking—had a great time out in San Francisco, but I used trolly cars and jitneys, so no accidents—other than a busted foot when I stumbled one night. That got me 40 years of government disability payments—almost worth it maybe. What happened was the broken bone wasn't set right, so my foot was weak from then on.

After I got out of the Navy I pretty much stopped drinking—perhaps a cocktail a couple times a year—but not if I'm driving.

This radar/jamming war will end when we have a fair system of speed limits. Hint: The European system of having no speed limits on many roads seems to produce fewer accidents.

We're into a philosophical wilderness when the government makes laws aimed at protecting us from ourselves. The recent case of a woman who took drugs which killed her newborn child being indicted for the child's death leads us into a potential for suits against mothers who smoke, drink, etc., during pregnancy and thus deprive their children of intelligence.

This overprotectiveness seems to fail when real money is involved. We know tobacco kills and maims, but we do little about it. We know alcohol kills and maims, but we still encourage it. Heck, alcohol is a major profit center for New Hampshire—which has its own liquor stores all over the state.

Am I suggesting prohibition again? No more than I'm in favor of the 55-mile limit. Many think pregnant mothers should be allowed to smoke, drink, and take drugs, all of which we know have bad effects on their children—many of whom we then have to care for in special institutions. We call them "special" children. Every effort should be made to make sure people know what the results of their actions are going to be.

We have a similar problem with drugs. Every effort to stop their sale has failed. It's only by education that any real changes can be made. As long as kids think it's cool to drink beer, we're going to have dead kids and lots of business for ambulances, hospitals, and doctors. As long as they think it's cool to do drugs, we're going to have more dead kids. Smoking is the best of all—with long-term benefits for the tobacco industry and the health care industry—plus the need for schools for brain-damaged children. Congress believes smoking is good for the economy—and obviously they're right.

So, let's say that every study showing the 55-mile limit is killing and maiming more than it saves is wrong—let's say that despite studies we decide that driving faster will cause more accidents instead of less. This would mean more business for the health care industry as well as the funeral business—a plus.

I like that new name for doctors—the health care industry. That's like when they changed the name of the War Department to the Department of Defense. How long before it's renamed again as the Peace Department? It's the sickness business and it'll stay that way until we have hospitals that keep people healthy.

How about you? Are you in favor of the government making more and more laws that force us to do what a political group thinks is right? Should it be illegal to smoke when pregnant? Should it be illegal to drink—even a little—and then drive?

One more thing—I don't want to hear that any of you have been sending jamming signals on 10.5 GHz with the explanation that, heck, you were just calling CQ on one of your ham bands.

DX

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MACQUARIE ISLAND VK0

Lonely Macquarie Island lies midway between New Zealand and the icy coast of Antarctica (see VK0GC's QSL card). A year-round crew of 22 researchers and staff inhabit the isolated island, with a handful of scientists joining them for a few months in the summer. They study cosmic rays, weather, and the upper atmosphere. Fortunately for DXers, at least one of the permanent staff has been a ham radio operator. Graham Currie VK0GC lived on the island for a year, and recently returned to Macquarie after an extended around-the-world tour. Graham has shared some of what life is like on this isolated Antarctic outpost with *73* readers.

Getting to Macquarie is trouble enough. With no icebreakers of its own, the Australian government that administers the island hires a suitable ship for about $20,000 a day. Each November (late spring in the Southern Hemisphere) the supply and crew rotation ship steams three days from Hobart, Australia, and drops anchor off the rocky coast. Helicopters and barges then begin ferrying men and equipment ashore. Again in February the ship returns with more supplies and to picks up the scientists who were there for the summer. For the next eight months the only contact Macquarie will have with the outside world is an occasional parachute drop from a C-130 and, of course, radio.

Weather on Macquarie varies from cool to miserable, with temperatures hovering just above freezing, frequent rain, and high winds. A fog bank shrouds the island 350 days a year.

Living conditions on the island are comfortable for such a remote location. An expanding library of videotapes, a "bar," and a pool table provide some recreation. Watching penguins and elephant seals is another popular pastime. More than 2000 giant elephant seals cluster around the living quarters. And some of the penguin rookeries on Macquarie hold more than 750,000 birds!

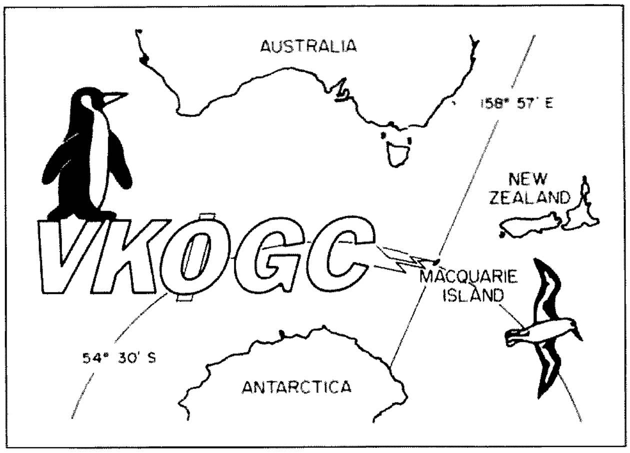
Ham Radio

The Macquarie Island ham shack sits more than 100 feet above the cluster of buildings that passes for "downtown" on the island. The long, winding trail up the hill leads to an excellent radio location, but please remember the hill when you ask for skeds. The shack is equipped with a Kenwood TS-120 and Collins 30S1 linear. One minor problems: Low-band operation interferes with the island's seismograph, registering little earthquakes in a CQ pattern!

"During the parachute drops, the entire population of the island stands downwind with their backs to the sea, hoping to stop mail and supplies from drifting into the ocean."

The antenna consists of six 450-foot-long wires arrayed across the north. (There's not much to work south of Macquarie!) Graham connects any pair of wires to a 600-Ohm balun and antenna tuner. Adjacent wires produce a narrow beam; other pairs produce a wider spread. Top-banders should note that the due-North pair seems to work especially well on 160 meters. The over-water leg of the antenna proved the most difficult to erect; hundreds of pounds of kelp dangled from the wire as they tried to raise it out of the ocean.

Why this unusual antenna? "Simple," says Graham. "It's the only antenna that can stay up all year in the face of 80-knot winds and salt spray."



Graham's card clearly shows the location of remote Macquarie Island.

Graham admits to some problems with his initial QSL procedure. Underestimating the demand for VK0 cards, Graham arranged a QSL mail drop with an Australian ham. However, this ham was not a true QSL manager, as Graham had no way to get the logs off Macquarie until the relief ship docked in November. (Parachute drops don't work in the up direction, and Graham's 100-word telegram limit couldn't cover his 6000+ contacts.) So the mail piled up until Graham returned to Australia at the end of his one-year tour of the island, a process that prompted many irate letters from impatient DXers. "The first thing I did when I returned to Australia was to spend the next two weeks, 8 hours a day, answering QSL cards," he remembers.


Graham Currie VK0GC on his recent round-the-world tour, between year-long stints on Macquarie Island.

For his second tour last year, Graham arranged for the cards to be sent to him on Macquarie, via periodic parachute drop. During these drops, the entire population of the island stands downwind with their backs to the sea, hoping to stop mail and supplies from drifting into the ocean. While this plan would have eliminated abusive letters to the "manager," it would not have provided a speedy reply to the DXer; return mail would still have to wait for the spring relief ship.

Fortunately for the peace of mind of DXers who could imagine THEIR card landing in the drink, Graham got an offer he couldn't refuse from Jim Smith VK9NS. Freed of a word limit on his teletype, Graham now types his log into an error-correcting, computer-data link from Macquarie to Australia, where the log is printed out and mailed to Jim on Norfolk Island. The process takes less than 2 weeks, compared to as long as nine months without assistance.

DXers looking for VK0 contacts should look for Graham VK0GC in the Brown Sugar Net, 14.309 at 0300Z on weekends. Graham also haunts 1.831/2 at 0900Z on Mondays. He moves to 3.795 if he doesn't get any takers on 160, but he'll return to 160 if asked. QSL via VK9NS. Sunrise 2200Z, sunset 0500Z. ■

ABOVE AND BEYOND

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FEEDBACK

One of the fun things about writing this column is the reader feedback, especially on points of contention (whether technical or otherwise). Back in June, I made a proposal to redefine the ARRL Band Plan for 23 cm to enable Novice weak-signal operation in the segment from 1294–1295 MHz, shifting the narrowband FM simplex segment down 1 MHz to 1293.00 MHz. Boy, did I get some interesting mail on this idea!

Mike Stone WBØQCD, who authors the ATV column in *73*, wrote via a QSL card: "Your proposal did not consider ATV subcarriers that already occupy that part of the band (sound at 1293.75 with video at 1289.25). This was all hashed out 2 years ago through many months of meetings. You are grossly overestimating the number of interested Novices. Why not share 1294–1295? Please research all modes before making such statements."

Well, there I go again! Mike, I based this proposal on observed activity here on the East Coast, where the predominant mode is SSB/CW. I admit I didn't have all the data from other parts of the country—sometimes it takes a column like June to get that response. And perhaps I am overestimating the number of interested Novices! For further illumination, let's take a look at comments filed by Tom O'Hara W6ORG (owner of P.C. Electronics):

"It has been my observation that 23 cm is a puzzle to most hams, let alone Novices. We have had an ATV exciter out for about a year now that will work with any of the 2/23-cm transverters with little sales volume. At Dayton this year, I asked Spectrum International, The PX Shack, and Transverters Unlimited to honestly tell me if they have had many sales or interest in 23-cm transverters, especially with Novice Enhancement. The answer was no."

Tom went on to say: "Gordon West [of Gordon West Radio Schools] found that those interested in VHF/UHF go straight to Technician class since it is only 25 more questions to take in addition to the Novice exam. When you compare the cost of 220 gear and band performance, the choice is obvious. Moreover, if one compares 2 meters to 220 or 23 cm, I can see why many say why not go ahead with the 25 more questions while I'm at it."

Tom was a member of the group that worked on the 23-cm band plan, especially with regard to ATV. He was in favor of releasing the entire band to Novices—as I was—and on his enclosed Southern California plan he notes that the upper 200 kHz of the 1294–1295-MHz segment has been reserved for Novice weak-signal work. This was not indicated on the ARRL plan, but I'm glad to see someone took it into consideration.

Both Mike and Tom raise the same point: Why not share 1294–1295 MHz? Indeed, considering the highly directional characteristics of 23-cm communications, with corresponding channel density, this makes sense. Perhaps that 200-kHz segment is all that will ever be needed for Novice weak-signal work—if Novices are capable of or even interested in this type of operation. Okay, guys—you've convinced me. The question is—can we get Novices up onto 23 cm to use that allocation? I'd like to hear from readers on this one.

"I asked Spectrum International, The PX Shack, and Transverters Unlimited to honestly tell me if they have had much interest in 23-cm transverters."

Nuts and Bolts Dept.

With the increasing numbers of transceivers, preamplifiers, and transverters coming on the market using GaAsFETs, I felt it time to discuss the proper care of same.

First, the good news is that the prices of GaAsFETs have dropped dramatically over the past five years. For example, my favorite all-around device—the NEC 411 series—can be had for as little as $1.50 in small quantities. Blow it up—no problem. Just solder a new one in. The bad news is that it still doesn't take much effort to blow one out, and that's VERY bad news for those using mast-mounted preamplifiers.

Let's consider a few things that don't mix here: How about Rf-VOX circuits and GaAsFETs? Specifically, solid-state amplifiers with rf-sensed keying (virtually any of the major brands on the market) which can create switching transients of enough power to obliterate the device in use. It's happened to me many times on 432 with a Mirage D1010N and an ARR 432VDG in a home-brew housing.

If you employ such amplifiers, either turn the drop-out delay to absolute minimum, or select the FM setting. This has no effect on the linearity of the amplifier—they run Class AB in SSB or CW—but disables the dropout delay system. Next, disable the Rf-VOX on your transceiver or transverter by switching such a circuit out or desoldering detection diodes. Lastly, employ a system of hard-keying with external relays to switch into transmit and actuate any external relays.

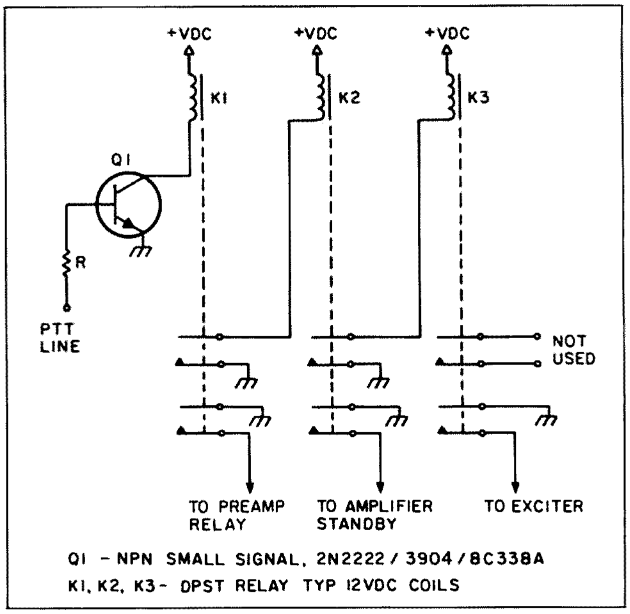

Fig. 1.

Even with such a system, rf transients from medium- to high-power amplifiers still pose too much of a threat to the GaAsFET. Now is the time to think of sequencing the various active parts of your station, such as the exciter, amplifier, and preamplifier. By sequencing, I mean a system where the order in which the active stages key or unkey is always the same, allowing small delays between each stage to ensure solid key-up/down. Ideally, with a mast-mounted preamplifier and single feedline, you'd want to switch the preamp out of the line, then switch the amplifier to standby, and finally key the VHF/UHF exciter.

When going into receive, the process is reversed: The exciter drops out, the amplifier goes out of standby, and then the preamplifier is switched back inline. In theory, all of the rf present on the line has dissipated before the preamp is connected. If sequenced correctly, this should be and is the case. But you must ensure that the sequence is always the same, every time.

Some common schemes employ a series of relays connected in a sequence (see Fig. 1) so that the contacts of the first connect voltage to the coil of the second, the second to the third, and so on. This isn't a bad idea, and in the key-up mode the relays will fire in the correct order. But how do you get them to drop out in reverse order? Removing the voltage to the first relay drops all of the re-

lays at once, which may or may not result in an rf spike going up the transmission line.

A more sensible approach is to use a ramping system, similar to that used in the Advanced Receiver Research sequencers (see Fig. 2).[1] This design employs an LM3900 as an integrator, driving four sections of an LM319 (functioning as a quad comparator), which in turn actuates reed relays. The trick is that the output from the integrator is a linear voltage up and down ramp. By using the voltage dividers on the + inputs of each LM3900 section to set a threshold trigger value, they will change state and pull in the relays in a precise order. When the voltage drops (key-up), the fall of the voltage across the − inputs is also linear and each comparator reverts to its original state in reverse order—causing the relays to drop out accordingly.

It's not very complicated, but it works very well. I've used this particular sequencer with a medium-power (300-W) tube amplifier on 432 MHz, and had excellent service until one of the reed relays hung up. A suggestion: Use mercury-wetted relays (available as an option from ARR). They cost a bit more, but are far more dependable, especially if you are switching fairly high voltages such as tube bias. Dow-Key or similar antenna relays can also create quite a spike across the reed relay and short it out.

A suggestion: Protect your relays (and related devices) by installing diodes backwards across the dc coil. Use a hefty diode: 1N914s won't last long. I use 1N4004 or 1N4007 types here. A .1-uF disc across the coil is also a good idea, and between the two they should eliminate any high-voltage transients.

If you employ the ARR sequencer, you'll notice four sets of contacts: one normally closed (NC) and three normally open (NO). I prefer to obtain a second normally closed relay and physically cut the power to the preamp before switching the antenna relay. There is an opinion that this is unecessary—maybe so. I felt it gave me extra protection, and the GaAsFET's certainly lasted a long time, so who's to say it didn't make a difference?

Another suggestion: Configure your station so that your mast-mounted antenna relay pulls in on receive—not transmit. Why? In case you lose power to the sequencer, the preamplifier is taken out of the line. When not on the air, cutting power does the same thing and affords extra protection if severe thunderstorm activity is nearby. Finally, should you manage to blow out the preamplifier anyway, you can still remain on the air sans preamp by again cutting the power to the relays.

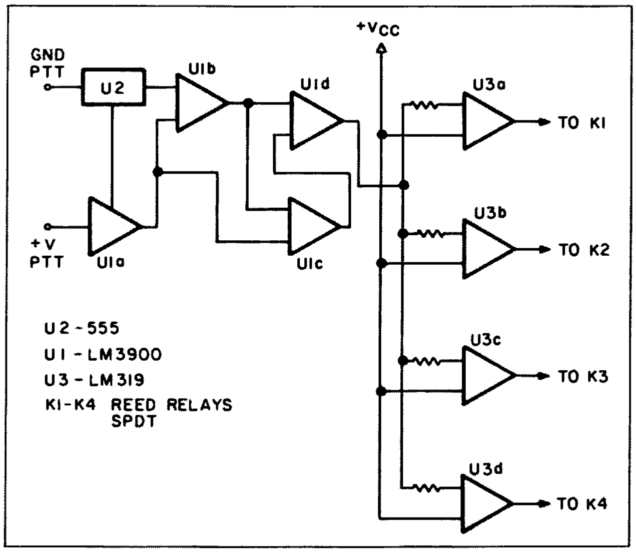

Fig. 2.

and attaching it to the rearward interface. The system allows duplex operation on any two bands from the control head, which is so small it can go almost anywhere.

The cost to get on one band is close to $800. Is it worth it? Could you go with a dual-bander on 2 and 432 for less money? Would four separate transceivers for 144, 220, 440, and 1260 be the cheaper way to go? How well does the darn thing work, anyway. . . or is this technology for technology's sake?

Good questions. . .and I hope to answer them in the next few months. This is a radical departure from any FM transceiver system I've ever seen, and the only multiband system that approached it in cost and sophistication was the late, lamented Drake UV-3 (for 144, 220, and 440). One thing's for certain—this will be the most unusual review I've ever undertaken. For one thing, I don't even have a trunk on my Honda Civic wagon (a minor detail).

"One of the most talked-about radios at Dayton had to be the new ICOM IC-900. . . "

And speaking of relays: Use good ones! Dow-Key types are expensive but worth it (in most cases). The little DK-77 series can be had at flea markets for about $10–$15 each and will handle 100–200 Watts up to 432 MHz. Derate above this frequency accordingly. The larger types will handle up to 500 W or more on 432, and the type G option affords nearly 100 dB of isolation between the receive and transmit ports. (This makes your kilowatt signal level look like 100 nanowatts at the input to the preamp.)

Dayton Update: Part II

One of the most talked-about radios at Dayton had to be the new ICOM IC-900, a unique multiband transceiver system using an ultra-thin control head, an interface/processor unit under the seat of your car, and a second rf head/interface in the trunk—lined by a fiber optic bundle. Adding a band is as simple as buying the module

Letters, Letters

I'm just starting to get through the backlog of mail received during our move to Pennsylvania. Ralph Marler K1YLO wrote in to tell of his renewed interest in VHF activity. Ralph plans to use a Hamtronics 144–148-MHz receive converter with a Cobra CB rig, and is thinking of employing a transmit converter as well. Ralph, most transmit converters require very little drive. It should be an easy matter to reduce the output of the Cobra to obtain the required drive—typically in the neighborhood of 10–300 milliwatts. As far as frequency conversion goes, it might be better to shift the LO frequency on the Cobra to obtain 28-MHz coverage instead of 27 MHz. I'm personally not familiar with the Cobra unit, but a glance at the schematic should reveal where to make the modification.

If the Cobra employs a crystalplexer, then a new selection of crystals and some minor bench alignment is all that's required. I have several friends who've done just that to various makes of CB radios, pulling them up to 28.500 MHz for 10-meter work. All it took was new crystals and a different local-oscillator frequency. After conversion, your Cobra should work just fine as an exciter for 2 meters as well as other VHF/UHF frequencies. Any readers have experience with this type of conversion?

Ralph also asks if using DSB on 2 is acceptable. Again, most stations are employing USB exclusively on 50 MHz and above. . . no DSB operation that I am aware of. All multimodes for 6, 2, 70 cm, etc., are equipped for SSB only (as well as CW, FM, and perhaps AM as well). In addition, those using low-band transceivers with transverters are also employing USB.

One inexpensive way to go is locate a secondhand Ten-Tec Argonaut, which lends itself very well to transverter work because its output is variable and under 5 Watts. It will provide USB/LSB/CW modes to boot, runs off dc with low current requirements, and is lightweight as well for portable work. You can probably find one at a flea market for under $200.

That's it for this month. Next month I'll have a report on our trip to Chincoteague Island for the June VHF Contest, as we attempted to give out grid square FM27 to the needy. In the near future I'll also be looking at the IC-12AT, and comparing the IC-03AT/FT-109RH 220-MHz hand-helds. Also, I plan to look at the Cushcraft 220B 220-MHz Boomer for weak-signal work.

Until then, see you Above and Beyond.■

Continued from p. 52

packet compatible, but as with FUJI-OSCAR-12, a modem will be required to communicate via the RUDAK experiment.

The uplink will be 2400 bits/s differential biphase PSK (phase shift keying) with a downlink using 400 bits/s PSK. If you ever listened to the PSK beacon on A-O-10 prior to its memory loss, this is how RUDAK will sound. More background on OSCAR-10's PSK can be found in James Miller's article "A PSK Telemetry Demodulator for OSCAR 10" in the April, 1985, issue of *Ham Radio Magazine*. The RUDAK system for Phase 3 C was conceived, designed and built by AMSAT DL.

Figure 2 shows the present configuration of A-O-10. In addition to Mode L, which is no longer operational, the engineering beacon has not been on, and the general beacon has been heard only as a steady carrier with no telemetry. A comparison of Figures 1 and 2 shows why amateur satellite enthusiasts are really excited about the potential of Phase 3 C.

FUJI-OSCAR-12

I have received many requests for a more detailed block diagram of my set-up for Mode JD (the digital transponder) on board FUJI-OSCAR-12 (Figure 3.) It may not be pretty, but it works! When I am operating via Mode JD, it seems like every electronic device in the shack is involved. This is a more complex system than most stations require, but with the exception of the G3RUH PSK modem, I didn't need any other new devices to complete my system. Keeping the cost down overcame any objections I may have had concerning complexity.

> ***"Keeping the cost down overcame any objections I may have had concerning my complexity."***

A few stations here in North America are very active on Mode JD. They are VE3JF, WB7QKK, KA9LNV and WA8EBM. Others have been on the air, but not as often. Most stations use homebrewed systems based on the TAPR design or have built systems using the G3RUH modem circuit board. The TAPR modem kit's entry on the scene in mid-June helped to increase activity.

Some JA (the analog transponder) operation has been reported, but much of the time, the satellite is recharging or in Mode JD. When the ground control stations complete their experiments for software uploading, we hope to have an operating schedule. In the meantime, monitor the nets and listen for JA or JD activity.

RS

Last month's prediction that the next Russian hamsat will be RS10 with RS9's name is holding firm. Sources in Europe have indicated that the "new" RS9 may even have three ROBOT autotransponders, one for each of the available modes, A (2 m up and 10 m down), T (15 m up and 2 m down), and K (15 m up and 10 m down). We are still anticipating a summer launch.

The older RS satellites, 5 and 7, have been hard to find. The battery problems haven't improved. However, assuming no further failures on board these veteran hamsats, we can expect excellent operating conditions in August and December when both satellites will be in continuous sunlight. The days prior to and just after these fully-illuminated periods will also yield good conditions for satellite chasers.

During the other months between now and the end of 1987, RS5 and RS7 will experience as much as 35 minutes of darkness during each two-hour orbit. October 15th will be one of the poorest days. It is unlikely that ground-control stations will bother to activate the satellites even for short periods when the eclipsing is at its worst.

Satellite Wave Listeners

The SWL, or Short Wave Listener, is everywhere. If you have made many international HF contacts, you have probablyreceived a few SWL cards. Nobody told these folks that they had to stick to terrestrial QSOs. They monitor the satellites too—all of them, and all modes. Who would guess that a CW QSO between Pearland, Texas and Parkville, Missouri via A-O-10 would be heard in Czechoslovakia on a home-brew receiver using a four-element Yagi?

When 10 meters is open, RS downlink signals may be heard when the satellite is many thousands of miles out of range for uplink on 2 meters.

If you receive a card from a listener, be sure to reply. These present-day observers may become tomorrow's participants and contributors. On the other hand, if you are not yet ready to transmit, or lack the required license level for a particular satellite mode of interest, try listening. It's good practice, and you may be surprised at what you hear!■

AMSAT OSCAR 10

Summary: Mode B: 70 cm up; 2 meters down Mode L: 24 cm up; 70 cm down Beacons: Mode B: General Beacon 145.810 MHz; Engineering Beacon 145.987 MHz Mode L: (No longer operational)

Mode B:	Uplink (MHz)	Downlink (MHz)	
		145.987	Engineering Beacon
	435.030	145.975	Passband limit, upper
	435.045	145.960	General use limit, upper
	435.050	145.955	
	435.060	145.945	
	435.070	145.935	
	435.080	145.925	
	435.090	145.915	
	435.100	145.905	
	435.105	145.900	Nominal passband center
	435.110	145.895	
	435.120	145.885	
	435.130	145.875	
	435.140	145.865	
	435.150	145.855	
	435.160	145.845	General use limit, lower
	435.180	145.825	Passband limit, lower
		145.810	General Beacon

Mode L: (No longer operational)

Source: Amateur Satellite Report 60/61, August 1, 1983 as amended

Fig. 2.

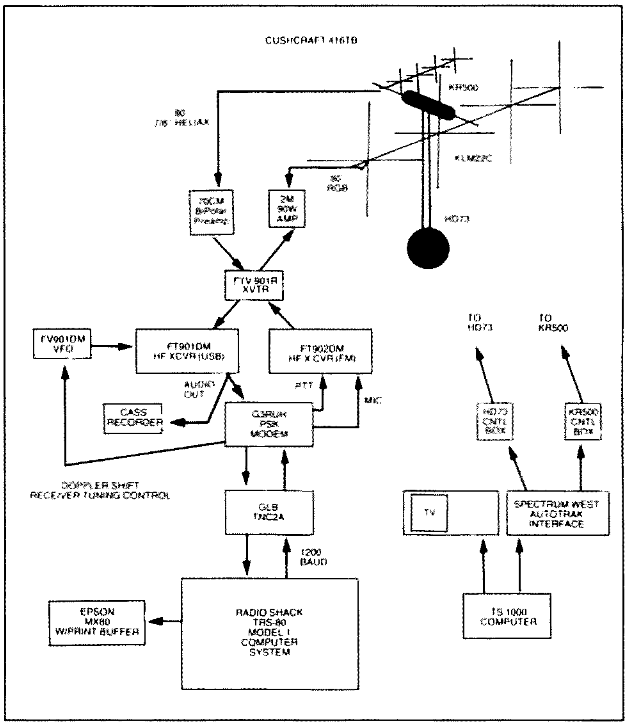

Fig. 3.

ATV

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STARTING AN ATV CLUB

This month, I'd like to speak about getting an ATV club started in your local area. When you're trying to get people who are interested in Ham-TV (FSTV, SSTV, and FAX) to "pull together" in the same direction, having an organized group or official club is very important.

I am past president and founder of two clubs in my area and secretary of another. I have addressed probably 20 or 30 amateur radio clubs over the past ten years and have promoted ATV, RTTY, SSTV, and FAX at meetings, hamfests, and demonstrations.

Step One

Let's assume you're starting from scratch. You have ATV equipment and one or two buddies on UHF with you. First, establish a clear 2-meter voice operating frequency. It can be simplex or it can be a populated repeater. If it's a repeater, be careful not to monopolize the system talking about the visual modes—there is nothing more harmful to your cause than a couple fellas yacking about their favorite modes night after night, preventing others from using the channel for their own two-way communications.

Most new groups pick a simplex channel to populate—144.340 FM is the most widely used ATV chit-chat spot on the 2-meter dial. Yes, FM is legal to operate down there, and no, you won't interfere with OSCAR communications. Many of us switch to SSB when the band is open and long-range communications are possible. Fig. 1 is a map that depicts where most of the FSTV "audio" activity is established across the U.S. Even if your group is only a handful of people, establish a regular ATV net day and time to meet each week. You may feel awkward calling together such a "net" with the same people you talk to all week long, but the important thing to remember is that you will start to get new "check-ins" who have heard of what you're doing and are interested in getting started. The first time a strange callsign jumps in on your net and asks: "How do I get started?" you'll see the value in having a regular net.

Get in there on the most active FM repeater in your area (just before or after a Sunday night net is a good time) and talk about the fun you are all having with ATV. Send your FSTV pictures and make comments about what you are seeing on the screen across town. Curiosity is your bait—be sure to mention the simplex frequency that you'll be QSYing to before leaving this repeater "fishing expedition." Continue your positive discussion—you can bet a few listeners QSYed with you. They may not jump in and say hello, but believe me, *they are listening*.

To illustrate this point, let me tell you about Paul WB9RZM of East Moline, Illinois. Paul walked up to me at the September, 1986, Peoria Hamfest and said, "Money is no object, how do I get started on FSTV?" After getting over the shock and answering some of his gear-buying questions, I asked him how he knew about our local ATV activity. He replied that six months earlier his VHF police scanner "locked up" on our simplex ATV frequency on two meters. He heard us laughing and having fun, night after night, describing what we were seeing with our at-home cameras and over-the-air UHF TV signals. He could hear the nightly chit-chat and technical discussions of problems, antennas, preamps, and the like. It wasn't really the visual medium that got him to move from "scanner listener" to active ATVer, it was the "friendliness and positive spirit of the entire group" that made up his mind. Today, Paul has a first-class FSTV station with color cameras, VCRs, and the like.

Speak Out

You will have to pay your dues for a few years by giving talks and demonstrations to all the local ARCs and at hamfests. Most hamfest committees will not charge for a table or booth demo setup if you go to them and explain what you intend to do. Even if you have to pay a little, isn't a few bucks spent worth the chance of snagging one or two genuine interested newcomers?

Many of you will have never spoken before a group before. Sure, you'll be nervous, but push that awesome podium aside and casually stand up before the troops near your displayed equipment and just talk about how you got started, what equipment it takes to get going, and what can be done with the mode. Ask for questions from the audience as you speak—don't wait for them to come at the end. These one-on-one exchanges will calm you down a bit. The first few minutes are always the worst. Somewhere, about two-thirds of the way through the presentation, you might even start to like the authority role. There is nothing more fun than to watch a ham be a "ham."

Targets

Who do you aim for in getting a group or club started? I've been most successful targeting in on VHF/UHFers who are already into RTTY, packet, OSCAR, etc., or who are actually building equipment and antennas. Another good sneaky tactic is to set your sights on a very popular individual whom everyone seems to like and admire. This individual should be active in all phases of ham activity (Dave WB0FBP was my target years ago, and boy did it pay off).

Try not to do live demonstrations unless you are sure they will work. Videotapes can be used more eloquently. There is nothing more depressing than if during your "live" P5 color, 3-mile demo someone yells out, "Well, you should see him like that, he's only crosstown." Some folks just don't understand the complexity and the challenge of ATV. Others will.

Don't just talk about equipment—put downconverters (case open) in their hands. Many are amazed that it takes such a little investment to "watch" ATV transmissions. Recently, after one such demonstration of our new weather radar "link feed," 18 ATV downconverters were ordered from P.C. Electronics. The timing was right: It was spring (in time for storms), the link had just been completed, and W6ORG had a $39 sale going on his TVC-4s. We followed up with more meetings to help these newcomers select or build antennas and to instruct them in how to use the ATV repeater system. About half of the people joined the club as associate members to get channel "access" privileges. This brought our total BRATS ATV Club membership to 50. If I had predicted that seven years ago, they would have hauled me off to the funny farm.

Constitution and By-Laws

You've got a following and you're not the only one checking into your established net, so it's time to hold that first meeting. What should you do first? This may vary with different ATV groups around the country, but you should enact a club constitution and by-laws (our club took 7 years before getting around to doing it). Don't let this scare you. Think of these as broad guidelines to go by and a proclamation that you have formed a club. (Send me an SASE and I will be glad to send you a copy or our ATV club's constitution and by-laws.) The constitution and by-laws spell out the purpose of the club, the elected officers and their duties, set membership categories and dues, etc. You can get as specific as you want with the document. It should not be taken lightly, however, and don't be afraid to put several meetings into working out the language. If correctly written, your constitution and by-laws will regulate the politics of your club and things shouldn't get out of hand.

Meetings

The club is formed and growing, so keep the meetings interesting with as many guest speakers as possible. Create projects and group-sponsored undertakings. Building a local repeater or, better yet, a remote transmitter is a good start. Put out regular newsletters, even it it is at your expense for a while. I did this for five years and never regretted it—new interest was generated through those newsletters.

Generating money is the toughest job. Members will quit smiling when you ask them to contribute their fair share towards something. I've come up with a lot of harebrained ideas for our multifunction system, and most members gave generously along the way. Send out tear-off return-mail donation forms with your newsletters. Publish the callsigns of those who contribute. Peer pressure works.

Goals

Don't get unrealistic in setting your club's goals. Too many well-intentioned ATV groups want to do everything "right now." You should take things one step at a time. Plan out each step of progress in building the system. Involve everyone in the decision making.

ATV/R systems in low-activity

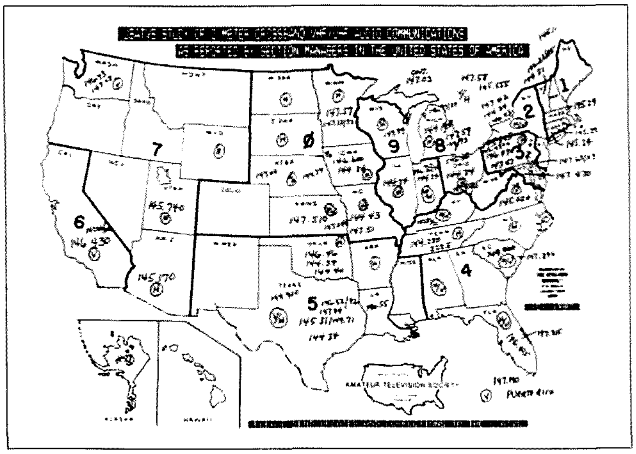

Fig. 1. A map of FSTV "audio" activity in the U.S.

areas often are built by individuals at great personal cost (money and time). Once the system is up and going, then the masses descend. Later on, most won't realize or recognize the work that went into building the system. A good example of this is what's been happening in Chicago recently:

Henry Ruh KB9FO, Dave Miller K9POX, and Jack N8GKO have been building up the KB9FO FSTV repeater and remote transmitting system (439.25/426.26). It will be Chicago's first such unique system, and activity to date in the Windy City has been pretty dead, to say the least. The KB9FO ATV/R system began testing a weather radar feed (from WMAQ-TV) in late December of 1986. Legal touchtone™ control (Part 97.88) by supporting Peacock ARC members began in May of this year. Initial opposition to this system came largely from one individual who objected to just about every phase of the system, declared it "illegal" and immoral, and even turned in supposed violations to the FCC. These supposed violations were declared invalid. Every time I hear this negative-thinking individual and his crumbling crown of simplex authority on the air, I think of *Star Trek II* when Spock says, "The needs of the many are outweighed by the needs of the few." Don't let anyone bully your ATV group off of its set goals. Try to listen to, reason with, and and cooperated with all involved, but if a thorn in the side persists, "Beam the disease out into space oblivion, Scotty."

August FSTV Contest

I'd like to invite everyone who's active on FSTV to participate in the sixth annual *Spec-Com Journal*/USATVS North American

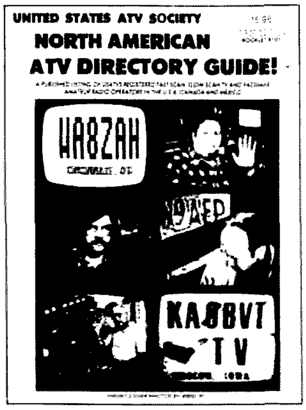

Fig. 2. The North American ATV Directory Guide.

FSTV QSO Party and DX Contest. This is the only ATV contest of its kind in the U.S. and it comes but once a year. It is a week-long contest to make the gathering of UHF signals more relaxed and to better take advantage of summertime propagation. The contest is from 0001 local time on Monday, August 17, through 2400 local time August 23. Complete rules and guidelines were published in the June/July and August issues of *Spec-Com Journal*. Back by popular demand is split receive and transmit scoring; new for this year is limited acceptance of repeater contacts (50% penalty). The rules are fairly complicated, so send an SASE to the address at the beginning of this column to receive the contest rules and log sheets.

The *North American ATV Directory Guide* is available from the same address for $6.95 ppd. When the commercials start appearing, it's time to change channels. Next time, details on the Pitcairn Island Color SSTV DXpedition. See you on the tube.■

LOOKING WEST

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NEXT IN BAND PLANNING: THE COORDINATOR LOTTERY

Choosing who is and who is not a legitimate amateur radio repeater frequency coordinator could be done by simple lottery if the FCC is forced to make such decisions. This amounts to a warning to feuding repeater coordinators that's been issued by FCC Special Services Division Chief Raymond A. Kowalski. It came in a telephone interview with Ray on May 13 during which he specifically asked that I pass along the gist of his words: "If a method like arbitration cannot be found or agreed upon and it does come down somehow to the FCC to decide [who is the legitimate coordinator], I'll tell you how we will probably decide—by lottery." For those unaware, in a lottery-type situation, anyone who wanted to become the recognized repeater coordinator for a given geographic area would apply to the FCC for this privilege. Then, on a given date, all the applicants names would be put into a giant "hat" and one name would be drawn as the winner. That person or group would then become the sole legal coordination entity for a specific geographic region to be recognized by the FCC. Experience as a frequency coordinator or longevity in coordination would mean nothing. The selection would be by random chance.

Kowalski states that the selection "resides within the locality where the principals are, and if they cannot come up with something locally. . . I don't know how they can expect people in Washington to decide." He added, "I don't think anybody would be too happy with a decision from Washington."

But I've Been Coordinating Repeaters for Years

Regarding longevity as the criterion for determining a legitimate frequency coordinator, Division Chief Kowalski noted that this cannot always be counted on: "It's been our experience that shenanigans sometimes go on under the authority of the "old-timer" on the block, or a new crowd comes in and finagles control of a coordination council. While I would agree that the established and long-recognized coordinators are the ones who should have, and in fact do have, a leg up, we always remain open to the possibility that there may be some reason by which they may forfeit that right."

Arbitration and the ARRL

Kowalski also indicated that the time has come for feuds between long-established, newer, and made-to-order coordinators to come to an end. At the Dayton Hamvention, Ray suggested that binding arbitration might be one way to solve the disputes. He expanded on the idea by suggesting that sources of such arbitrators might come from a professional arbitration service or could be drawn from the ARRL's pool of lawyers who participate in the League's Volunteer Counsel program.

It should be noted here that, to date, the ARRL has steadfastly refused to become directly involved in matters of frequency coordination or development of political policies in that regard. The only aid provided to repeater coordination and band-planning efforts by the League has been in the area of long-term Advisory Committee studies and board approval of a small number of band plans, with the proviso that local option to these ARRL-approved band plans always supersedes the national nature of the plan itself. The ARRL is also working toward the establishment of a communal data base for information exchange between frequency-coordination entities, but will not give itself access to it. Nor will it take any active part in maintaining the data base other than providing incoming telephone access to it and physical hardware repair. Based on this, it isn't known whether the League's Board of Directors would authorize an activity such as their Volunteer Counsel acting as an "arbitrator" in disputes between frequency coordinators since this would place the ARRL and the lawyer acting as arbitrator in the position of legal liability for the outcome of the arbitration hearing, unless both (or all) parties involved in the dispute were first willing to sign a "good faith agreement" releasing the arbitrator and sponsor from legal responsibility.

Where the Problems Are

Currently, the only known disputes between frequency coordination entities are in Kansas/Missouri, California, and Alabama. However, any decisions made by the FCC concerning any of these three will impact on volunteer frequency-coordination efforts throughout the United States and its possessions. Let's look at what's happening with all three.

Alabama is the easiest to report on, since that one has been quietly winding itself down for the past year. All sorts of problems beset Alabama almost two years ago when the then-leadership of the statewide Alabama Repeater Council decided to move Alabama to the Pacific Northwest 20 band plan. Now, if you were to look at a map of who is using what band plan where, it would become immediately apparent that going to 20 kHz would not be popular with Alabama's neighbors. All of them were already 15 kHz upright in accordance with the ARRL 2-meter band plan. It wasn't the change to 20 kHz itself that angered a goodly number of repeater owners. It was the way in which the decision was made. It was made in a "do it now and we'll discuss it later" fashion.

As a result, a large number (or a small number. . . it all depends on which side you are listening to) of system owners decided to abandon their local council and seek representation through the neighboring CVRA-Southeastern Repeater Association. Not wanting to be charged with plundering a neighbor, CVRA-SERA put the issue on indefinite hold, probably in the hope that it would cool down by itself. For CVRA-SERA, it was a wise decision but it did not help restore order in Alabama. FCC officials ended up doing it. Rather than see a bad situation grow worse, members of FCC Atlanta Georgia were asked to be mediators in this affair. I don't exactly know what was said in the meetings with the rival factions in April and May of 1986, but things were worked out. As a result, the Alabama Repeater Council is well on its way to recovery! Oh, I still get letters from disgruntled repeater owners in Alabama, but these are becoming few and far between. Which band plan they are using? The last I heard was from Sam Davis NR4A last fall. He said at that time it was being left up to the repeater owners as to whether they wanted their system on a 15- or 20-kHz center. If any shift in this policy has taken place, I am not aware of it right now.

The California issue is quite a different matter. Rather than rivalry between members of a single group, as was the case in Alabama, the issues in southern California are between two repeater coordination entities that both claim domain over the same piece of spectrum. Kowalski confirmed that he had written a letter to Daniel Granda KA6VHC requiring him to provide proof that the repeater council with which he is coordinated is the valid coordinator for the 220-MHz band in southern California. Ray explained it this way: "At this point, Granda's repeater operation conflicts with another repeater operation. The other repeater has been coordinated by the 220-SMA (220-MHz Spectrum Management Association of Southern California); Granda's repeater apparently has been coordinated by an outfit called 220-FCC (220-MHz Frequency Coordination Commission). So we have asked Mr. Granda to tell us more about his coordination before we make any final determinations about whether or not he actually does have frequency coordination." The 220 Frequency Coordination Commission is a newly established coordination organization. Almost every other system operating on the 1-1/4-meter band in the same geographic area has been coordinated by the long-established 220-MHz Spectrum Management Association of Southern California. This group came into existence in 1979 with the dissolution of the old Southern California Repeater Association into 220-SMA and the Two-Meter Area Spectrum Management Association. The SCRA in turn traces its ancestry right back to the original California Amateur Relay Council. CARC was the world's first repeater-coordination body, being founded in the mid-50s. And, as I learned just the other day, while the CARC has not been active in almost two decades, its corporate charter has never been cancelled. As such, it could easily be reactivated at any time to become the official California statewide repeater and band-planning council if need be. Will it be needed? Only the FCC can answer this one. And that brings us to the Kansas City

vs. the Kansas State and Missouri State councils. Frankly, I'll need a whole column to describe that mess. It's a humdinger, and I will try to explain it next month.

FCC vs. IARN

You have probably never heard of Glenn Baxter K1MAN, but the FCC has. The Commission has served him notice that his assistance to the CBS News Network during the October, 1986, El Salvador earthquake may have been a violation of FCC regulations on the use of amateur radio for business communications purposes. During the early hours of the devastation of the tiny Central American nation, Baxter's International Amateur Radio Network was one the few links between the media and the earthquake-stricken nation. In fact, during the hours just following the quake, there was no way for anyone to accurately determine whether any other means of communications existed. Phone service to El Salvador existed, but service to the destroyed portions of the capital city of San Salvador was wiped out. Baxter thought that he was providing a service within the framework of the spirit of the amateur rules, but now he has been informed that his well-meaning efforts may carry with them some severe penalties.

What the FCC Said

The Commission notified Baxter of the apparent rules violation in a letter from Personal Radio Bureau Chief John B. Johnston W3BE, based on a letter of complaint to the FCC from Col. Thomas J. Kay of Panama City, Florida. Kay wrote to the FCC based on his monitoring of the K1MAN/IARN operation. He wondered about its legality, and supplied the FCC with a tape that included "apparent instances" of interviews being conducted by CBS network reporters using the facilities of K1MAN's station. The Commission letter to K1MAN questioning his activities is as follows:

"We have received a complaint about an amateur radio contact between your station, K1MAN, and station HC2DZ/YS1 on the frequency of 14.275 MHz, on October 10, 1986, at approximately 4:05 p.m. (EDT). The complainant provided a tape recording of that contact. That recording and a newspaper article you recently sent to us indicate that your station was being used by Marc Singer of CBS News to conduct interviews and to gather information concerning an earthquake in El Salvador.

"Section 87.110 of the FCC rules prohibits business communications by an amateur station, except for emergency communications. Emergency communications as defined by 97.3(w) of the FCC rules are amateur radio communications directly relating to the immediate safety of life of individuals or the immediate protection of property.

"Section 97.113 of the FCC rules prohibits amateur stations from engaging in any form of broadcasting. An amateur station may not be used for any activity directly related to program production or newsgathering for broadcast purposes. News information may be conveyed by an amateur station only when all of these conditions are met: (1) the event is unforseen; (2) the news information is directly related to the event; (3) the event involves the safety of human life or the immediate protection of property; and (4) the news information cannot be transmitted by any means other than by an amateur station because of the remote location of the originating station or because normal communications have been disrupted. If alternative communication facilities are available, an amateur station may not be used to convey the information."

Baxter Fights Back

In his prelimininary response to the citation sent on February 29, Baxter noted in part: ". . . be advised that Mr. Singer at CBS News and I were well aware of the rules cited in your letter at the time of the San Salvador communications crisis in October, 1986, and we were both taking pains to comply with those rules while simultaneously providing an important public service."

Baxter says that the information generated during the nine-hour period that CBS News was continuously connected to the phone-patch facilities at amateur radio station K1MAN via an open line between Belgrade Lakes, Maine, and New York City was that first, the U.S. Embassy was completely destroyed, and later, there were no U.S. Embassy casualties. Mr Singer and I made every attempt to get every scrap of information to confirm and verify this conclusion throughout the connect period.

Also, per request to radio station K1MAN from BBC London, CBS and I obtained all the information we could from every available source and passed this information to the BBC as they were understandably frantic about the 80 British nationals in San Salvador and planning a British rescue effort for British citizens. CBS and K1MAN were also very concerned about Andy Triaz, a CBS reporter in San Salvador who had not been heard from and who was not communicated with by CBS until the following day.

Finally, since K1MAN's only phone line was tied up for the nine-hour contact period, CBS News staff in New York made scores of outgoing telephone calls with messages from San Salvador. I am quite proud of the very professional manner in which both CBS and amateur radio station K1MAN acted in this matter.

Baxter's reply to the FCC allegations against him also included a formal request for a copy of the letter of complaint from Col. Donald J. Kay and a copy of the audiotape filed to the FCC by Kay with his letter of complaint. K1MAN has also written to CBS Network Anchorman Dan Rather, to advise him of the complaint. Unknown is why Col. Kay filed this complaint in the first place and what punitive action, if any, the FCC may be contemplating against CBS News, K1MAN, or both.

My View

This editorial comment is not in support of K1MAN or of any claims he may make. Rather, it is a short essay on our times, and does not necessarily reflect the views of anyone else at *73*.

It is becoming very apparent that those who write and enforce the FCC rules have no idea of the "real world" outside their offices, especially the "real-live" world of gathering and disseminating news during crisis conditions. Being employed by a television station and proudly allied to its news operation, I happen to understand what the FCC does not, namely, when there are people hurt and dying in a foreign iand and who have relatives here in America who are worried about their welfare, the FCC PART 97 RULES CAN BE DAMNED! The needs of the many definitely outweigh the bureaucratic needs of the Washington few. If ham radio is the only way to get the word that Americans are seeking, then so be it!

For the record, as far as this reporter is concerned, Part 97.113 of the FCC regulations stinks. It impedes the very purpose of the amateur service as outlined in Part 97.1. Part 97.113 by its very nature is archaic and it should be done away with. If I found myself in the position of K1MAN, I would take the same course of action since, to paraphrase once again, the lives of the many are more important to me than the rules of the few.

About a year ago, I was discussing this very issue with a high-ranking FCC official who shall remain nameless. His contention and that of his staff was that the rules are so tightly written in order to prevent the ". . . Amateur Radio Service from becoming the Amateur Radio Broadcasting Service," that is, to prevent broadcasters from using hams and amateur stations as a way of cost-cutting in the newsgathering process.

The FCC supposedly trusts us enough to give one another tests and to police our bands for regulatory violators. Isn't it time to let us decide what is and is not an emergency and to act in accordance with what we believe is the best interest of all concerned? If this is not the case, then it's incumbent on the FCC to reassume testing and all phases of regulatory enforcement. since this so-called "trust" does not really exist at all.

Finally, this is a view a lot of you won't like, but read on, anyway. I consider myself to be a realist living in a real world. This being the case, if it ever comes down to becoming the "Amateur Radio Broadcasting Service" or having ham radio disappear altogether, I vote for becoming allied to the broadcast community. First of all, a goodly number of people in positions of power in broadcasting are already licensed amateurs. The industry has far more money and more political clout then we will ever have alone and would make good allies, especially in times when our bands are threatened, such as the present! Have you already forgotten the General Radio Docket 87-14, that FCC-generated fiasco?

I have lots more to say on this, but unfortunately we are out of time and space. That's all from the soapbox this month from those of us who write the late shift in Los Angeles. ■

RTTY LOOP

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THE AEA PK-232

Those of you who have been following this column for the past decade or more (and, judging from your letters, cards, calls, and E-mail, I know that there are quite a few) are probably quite aware of my love affairs with various computers. Well, a new box has graced the shelf at WA3AJR, and while it is a computer of sorts, I think it would be a welcome addition to even the most compuphobic (another point for the neologists) amateur. I alluded to the AEA PK-232 interface unit last month, and from what I have seen so far, it may well be the ultimate answer to the ham wishing to enter the world of digital communication.

Let's have a look at some specs. In this little box, about the size of a sheet of typing paper and 2-1/2" high, is the capability to run RTTY, Baudot/Murray, ASCII, AMTOR, Morse, packet, and FAX using only a dumb terminal or essentially any computer capable of communicating with a modem. I won't show you a picture of the thing, as I'm sure AEA is running an ad somewhere in this magazine, so if it really bothers you, go ahead and look that up now—sneak a peek at the front panel and then come on back so that I'll have your full attention.

About the only way to tell you about this thing is to go through its modes, step by step. That way, I'll try not to forget anything (although the word processor helps me hide those blunders) and you can skip paragraphs which refer to modes you are not interested in.

Provisions are made on all modes to run in several interface systems. Input can be either receive audio or TTL level to an external modem. Outputs to the radio may take the form of transmit audio, either positive- or negative-keyed line for CW, and direct FSK, as well as a modem output. Additionally, for those who get off on dancing ellipses, oscilloscope outputs are provided as well.

There are front-panel indicator lights (LEDs) for mode, status of packet, AMTOR, ASCII/Baudot, and . . . well, uh . . . just about anything the box is doing at the moment. It may be a backwards tribute to the designers, in fact, that the one thing I needed the manual for the most was to understand the damned lights!

Also on the front panel, by the way, is a ten-segment LED bargraph display which displays the audio frequencies being tuned. I assume that this is some kind of discriminator. A threshold adjustment and a push switch for two radios complete the rather full complement of front-panel khazzeri. As I said, have a look at the ad if you want to be impressed by rows of LEDs.

Morse

Anyway, using this high-tech box on low-tech Morse is reasonably straightforward. Once set to Morse mode, the PK-232 will track the receive speed automatically and, if desired, the speed can be locked in to avoid glitches from static crashes or interfering stations. As far as transmit speed is concerned, it can be specified as anything from 5 to 99 words per minute. Incidentally, at speeds under 15 wpm, the characters are sent at 15 wpm and the spacing between characters is lengthened to yield the requested speed. This is in keeping with many code learning theories (right, Wayne?).

In Morse mode, characters can be sent as typed or by the word, and special CW groups from AS> to SK>, and then some, are supported. In essence, running Morse on a PK-232 looks like RTTY!

Baudot

Up a notch is Baudot (which we call Murray) operation. Setting the mode to Baudot brings forth a whole slew of options. Standard rates of 45 to 300 baud are supported, which cover the spectrum from 60-wpm RTTY (old style) to faster than I care to think about (almost 400 wpm). You can force LETTERS, FIGURES, send your callsign at the touch of a key, or even send a CW ID if you like. An option that may be turned on or off is Unshift On Space, which is very useful with QSOs but annoying if you are copying columns of figures, as with weather reports. A simple ON or OFF command is all it takes.

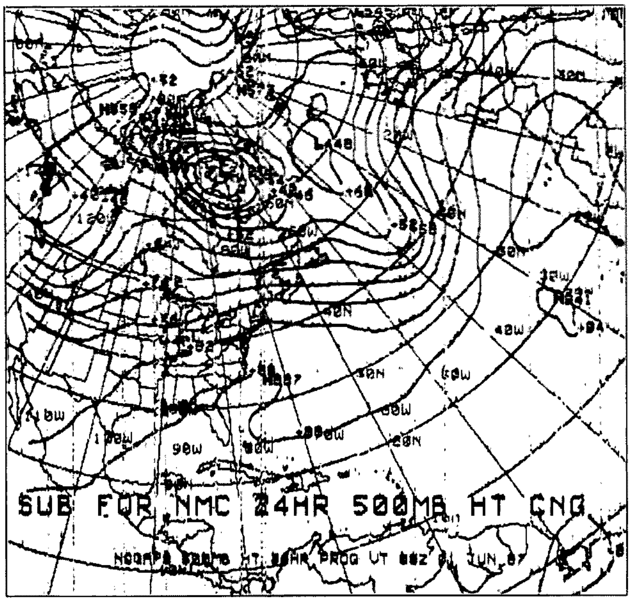

Fig. 1. Weather map processed by the PK-232.

One feature I have seen nowhere else is support for the international version of the Baudot code, CCITT ITA #2. Upon command, characters typed may or may not be translated into this internationally recognized alphabet. And yes, the manual even tells you the differences, and when to use what.

ASCII

Although I don't think there is as much ASCII RTTY around as Baudot, this mode is supported as fully as Baudot on the PK-232. Baud rates up to 300 are supported, with the added feature of being able to shift up or down one step without having to specify a specific rate. Of course, the full ASCII character set is supported, and that venerable CW ID is even available. I should note that this is classic seven-bit ASCII, not the eight-bit "parity-added" variety sometimes bounced about, so noise errors may be a problem. But that's why AMTOR was born.

AMTOR

We haven't talked too much about AMTOR in the past few years, other than an overview some time back. In part, that is because so few of you have expressed an interest in the mode to me, and in part it has been because of the paucity of equipment to run AMTOR. Well, if the latter is true, then the PK-232 should do much to alleviate the shortage.

AMTOR is covered at some length in the PK-232's manual, even including thoughts by the guru of the mode, Peter Martinez G3PLX. For those who have never operated this error-correcting form of RTTY, the two operating modes, ARQ and FEC, are covered, with hints which one to use when. Starting and maintaining QSOs, developing a unique SELCAL, and use of the ARQ break-in technique are all covered. In short, AEA provides enough documentation to help get you started on what to many is an unknown mode.

An aside, if I may. It occurs to me at this point that maybe, just maybe, some more on AMTOR may be appropriate. Is it? If you would like to see more on this spur off the line, let me know. As I said, lack of expressed interest is at least half of the reason I haven't said much on the amTORPIC (sorry!).

Getting back to the PK-232, you have your ARQ and FEC modes, as well as selective FEC mode. All kinds of options are supported, whether you want to engage in round-table, traffic, or bulletin-type operations. Speed is set at the 100-baud rate legislated for AMTOR operation. And all kinds of helpful hints and tidbits of information are given for this mode of operation. Like I said, the PK-232 just might encourage AMTOR experimentation by amateurs who bought it for its obvious forte—packet—and decided to try another option.

Packet

Did I say "packet"? Clearly, the PK-232 enables users with most any station capable of operation on packet frequencies and a terminal to enter this exciting new mode. As with AMTOR, there is a lot of information in this manual about packet, although it is not packaged like the tutorial for AMTOR. Although it should suffice to say that the PK-232 can do anything possible on packet, perhaps some examples would be in order.

To begin with, radio data-link rates of 45 to 9600 baud are supported, with the default being 1200 baud. Automatic operation, beacon operation, digipeater operation, and auto-answer are all easily implemented. You can set up a list to accept or reject connections from up to eight callsigns. You can leave a message, kind of a "Packet-o-Phone," to be sent if someone connects with you and you're not there. You can even set your station to monitor the channel, but connect with no one, and digipeat nothing, even if requested.

Speaking of monitoring, the PK-232 allows you to monitor activity on the channel ranging from round-table unconnected frames to every blessed thing on frequency, even if the error correction is wrong.

If you're a yenta, the PK-232 can provide all kinds of information in the most revealing mode. Different types of packet frames, frame numbers, and other information are discernible.

A real-time clock is also onboard, although it is not maintained when you power down, which can date- and time-stamp monitored signals.

About that power down . . . the PK-232 has an internal battery, made of three AA-size cells, which maintains your callsign and default information, such as last mode used, etc. It does not maintain the calendar or clock, though. (Working on that one, guys?)

Back to packet, the PK-232 supports up to ten multiple-connect channels, with channel switching enabled on any user-selected key. Of course, a full display of all channels in use, and who is where, is also available. Who needs a dedicated display?

All in all, the PK-232 provides fully capable packet station operation, which should satisfy everyone from the beginner to the advanced operator. For the beginner, by the way, the manual has a section that appeals to those of us who just can't wait to get on the air. And, when confronted by the 1.5-cm-thick book that accompanies the PK-232, who can blame us? Anyway, a "Quick Start" section takes you step by step through initial testing, installation, and operation quickly and painlessly, and almost holds your hand if you have problems.

FAX

As if all that wasn't enough, the PK-232 has two more features that stand to knock the socks off the rest of the boxes on the shelf. The weather map in Fig. 1 was received here at WA3AJR on 3.357 MHz, processed by the PK-232, and printed on an Epson-compatible printer. The PK-232, you see, has a FAX mode that allows the reception and transmission of pictures using the FAX technique.

Reception of FAX transmissions on HF is one of the easiest things I've done in ham radio. All you need to do is connect the printer to the PK-232, using a supplied cable, and the computer or terminal to the PK-232 using the same cable (it's a "Y" in case you haven't figured that out), set the mode to FAX, and tune in a FAX signal. Here in the East, 3.357 MHz comes booming in, and the manual gives other suggestions. Lists of frequencies are frequently published here in *73*, as well as being available on Delphi and CompuServe.

Data can be printed or, if a computer which can save eight-bit data is connected, saved to disk for later printing. Or, it can be transmitted from disk or other modality, with the PK-232 able to do all the work in that regard. Look at that chart and realize that little effort went into receiving it. Remember also that not only charts, but satellite photos, and even news photos (if you find the frequencies, let me know) are out there, all for grabs with a receiver, printer, and PK-232, then tell me you're not impressed. Humbug!

SIAM

Well, if that does not impress you, this will. The PK-232 can tell you what you're listening to. Not with 100% accuracy, but it's a lot better than your ears. With a mode called SIAM, standing for Signal Identification and Acquisition Mode, and trademarked by AEA, the PK-232 can identify the type and speed of digital signals, and has the Russian Cyrillic and Japanese Katakana character sets as part of its repertoire.

After setting the appropriate mode and tuning in a signal, the PK-232 will indicate a confidence level, such as 0.50, if it is 50% sure, 0.68 if 68% sure, etc., and what it thinks the signal is, i.e., Baudot, ASCII, AMTOR, noise, or a few others. If it is a signal which the PK-232 can print, typing "OK" will enable reception of the signal in the selected mode. Then it's up to you. Now, that's got to impress you!

Cost

I think you will agree that the AEA PK-232 represents an outstanding interface, filling a wide range of functions in the modern amateur station. What's that I hear you asking—the price? Well, the PK-232 lists for about $320, and I called around while writing this column and got varying dealer quotes with some under $300, so discounts are available. Now, before you get all hot and puffy about that price, let me point something out. In 1973, a brand-spanking new HAL ST-6, a unit which remained a standard of comparison for many years, sold for $360. That's $360 1973 dollars, not 1987 dollarettes! I'll leave it to the statisticians among you to let me know what that would be in today's currency, but the value for the dollar is apparent. The PK-232 is some fine piece of gear.

I'm sure that AEA would be happy to send you more literature; just drop them a line. They've finally gotten out of that PO Box they were in for years—never could understand how they could work in such cramped quarters, anyway! Send notes to AEA at 2006 196th Street SW, Lynnwood, WA 98036, and don't forget to tell them you read about it in *73*'s RTTY Loop!

Hmm, looking around the page, it looks like I've about used up my space. I have some books over here to tell you about next month, then some more on tap after that. Well, with September around the corner, reading for next month seems in order to me. Don't miss the next literary edition of this individual's rippling RTTY Loop! ■

WEATHERSAT

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PROBLEM SOLVING

Shortly after the middle of May, I returned from a week in Washington (paleontology at the Smithsonian, not satellites) to discover that the WEFAX-receiving installation was delivering noise instead of the expected satellite signal. What follows is a practical exercise in fault isolation that becomes second nature to experienced satellite diehards.

Step one was to ensure that all elements of the system were still powered up and properly interconnected. Seems simple but it is amazing what can happen around the house when you are gone for any significant period!

Step one was a washout—all cables were in place and everything was properly supplied with DC at the proper voltage. Step two is a quick one—scope out the antenna to ensure that it hasn't been knocked out of alignment by a windstorm, low-flying UFO, or an exuberant insulation contractor. Step 2 was also a washout. Too bad, now we have to go beyond the simple "is it plugged in?" to the "is it working?" stage!

Step three involves some basic rf checks. The first one is easy. Using a 137.5-MHz weak signal source such as the one in the *Weather Satellite Handbook* (WSH), (3rd Edition, available from Richard Taggart for $12.50; postage and handling: U.S. $1, $2 elsewhere), it should only take a few minutes to confirm that the VHF receiver is still functioning.

That leaves the S-band part of the system, and weak-signal sources for 1691 MHz are harder to come by. Years ago I purchased such a source from Paul Shuch at Microcomm (14908 Sandy Lane, San Jose, CA). I have this source hooked to a feedhorn and shooting out a basement window. The whole thing is arranged so that I bounce enough rf off our local water tower to produce a full-quieting signal. This approach has an advantage in that it tests the *entire* S-band system—antenna, preamp, feedline, and converter. Incoming signal levels were right where they should be so where was the satellite signal?

At this point we can either fire off a frantic call to Washington or engage in some productive head-scratching. Since we are talking about a Sunday afternoon, the Washington option will have to wait; I am left with nothing more than rational analysis!

The recent successful launch of the GOES East replacement has restored a measure of order to the U.S. geostationary program. A new GOES E is on station and the spacecraft that has been serving double-duty at a position intermediate between the normal GOES E (70°W) and GOES W (135°W) positions has now been maneuvered over to the normal GOES W slot. My particular elusive spacecraft is GOES Central. This bird is normally parked at 107°W but has spent the last year at 114°W while the entire system was making do with a single imaging spacecraft. What if they have moved it back 5 degrees east while I was palavering in DC?

I always hated dish realignment sessions, mostly because they involved so much extra work. I have used all sorts of techniques in the past to optimize alignment. One gimmick was to set the ATV station camera up on the receiver signal strength meter and then haul a TV out to the antenna site to watch the meter as I tinkered with elevation and azimuth. At other times I would simply run a long audio line out to the antenna and use a pair of headphones.

The approach I use now is far easier. About a year ago I purchased a set of 49-MHz two-way FM transceivers from Radio Shack. Similar units are available from a number of outlets. The radios clip on a belt and feature a headset with a microphone and whip antenna. I simply take one of the units and set in up next to the station receiver with the system set on VOX. I put on the second unit, stroll out to the antenna, and proceed to adjust the antenna while listening to the results. Two-meter radios have a tendency to desense some satellite receivers but the extremely low-power 49-MHz units present no problems.

Swinging the antenna a bit off toward the east brought immediate results and I was sure that I had found my wayward satellite. The system was peaked in both azimuth and elevation, but although the signal was plainly audible, it was *not* full-quieting! Noise was clearly evident at all times—yet just a week previously I had over an 8-dB gain margin with my four-foot (1.2 meter) dish! Although I had found the spacecraft, it was quite clear that I wasn't out of the woods yet!

As I finally got the old gray cells into high gear it became obvious that the GOES C I was watching could not possibly be the same spacecraft I had been monitoring prior to my trip. Regular readers will remember that a few months ago I was explaining why GOES C signal strengths were so variable during the course of a day. The aging spacecraft simply did not have sufficient fuel to correct for progressive plane errors in its orbit and it was now drifting over five degrees above and below the equator each day. Given the fuel situation, there is no way they would have been able to initiate an eastward drift to a new operating station! It was also clear that this spacecraft was *not* showing any plane error significant enough to cause a shift in downlink signal strength. The conclusion was inescapable—they must have switched over to a new spacecraft. With that much decided, I could make a major deduction—sitting over 22,000 miles from the mysterious bird—that it probably bore a Hugh's nameplate!

To understand that bit of Sherlockian wizardry you have to know just a bit more about the genealogy of the GOES spacecraft. All of the original SMS/GOES spacecraft had been manufactured by Ford Aerospace, yet all the recent operational spacecraft in the series have been manufactured by Hughs. The two spacecraft are *almost* identical in functional terms but the difference is *not* trivial. The original Ford spacecraft transmit the equivalent of horizontal polarization. If you are essentially north or south of the spacecraft, the downlink signal will appear to be horizontally polarized. In contrast, the same geometry with regard to one of the Hughs' spacecraft will produce a signal that is *vertically* polarized. It is important to realize that GOES C is always a "used" spacecraft. Almost always, failures of operational spacecraft involve some aspect of the complex imaging system so that when a particular spacecraft is eventually replaced, the old one is shunted aside to a parking orbit, often with a perfectly functional transponder. It is from this pool of "used" spacecraft that candidates for GOES C are selected since the central spacecraft is required only to relay WEFAX, not do any imaging. Since I prefer monitoring GOES C, I have left the antenna feed essentially horizontal. If my prediction was correct, the powers that be had finally worked through their supply of old "Fords" and were now using a "previously owned" Hughs with a mere hundred million or so miles on its orbital odometer!

The theory was easy to test, for if it was correct, I would merely have to switch the feed over to vertical to restore my usual gain margin. A few minutes back at the

Photo A. The author's 1.2-meter dish mounted outside a convenient window.

antenna to switch from horizontal to vertical, and *voila*—back in business with a full-quieting signal and an even bigger gain margin than I had enjoyed previously!

The take-home lesson from this is really quite simple. When something as complex as a satellite system suddenly goes out, the key is a systematic step-by-step approach to discover what the problem might be. A complete check of the ground station gear should always be step number 1. Take the checks a step at a time and do not *assume* that you have had a catastrophic failure. That is always possible but is rarer than you might think.

The point is, you need to be sure before you hit the network, either by phone or bulletin board, with questions about what happened to satellite X. If there has been a change in the status of a particular spacecraft, you will eventually hear about it, but if you have to wait for the periodic information notes, you may have torn your system down to bare components in the meantime! If the system seems to check out, contact other operators by phone or BBS to confirm any possible operation problems before hitting the phone lines to Washington. The amateur satellite community has a hard-earned reputation for reliable reporting of system anomalies, and we don't want to risk that standing by careless reporting of problems that may exist in *our* hardware and not theirs!

By the way, a later check via the bulletin board network confirmed that GOES 5 (a Hughs spacecraft) was now serving as GOES C with all other spacecraft on station (GOES E at 75°W, GOES C at 107°W, and GOES W at 135°W). GOES C presently has a 0.5 degree plane error which should result in minimal daily signal changes at the moment. There is *no* fuel reserve for plane changes, however, so expect the plane error to accumulate with time!

An Alternative Dish Antenna Mount

I have operated a GOES WEFAX installation for a number of years now, and for most of that time I have had my dish antennas mounted on posts out back, running long lengths of coax to get the signal back to the station. This requires that I keep converters in weatherproof boxes out at the antenna site and presents serious problems with temperature drift with some converters, given the extremes of our Michigan climate. This arrangement also insures long treks out to the antenna farm to make adjustments, and that is definitely not fun in the dead of winter.

Photo B. Jack Hawkins' (WB6WJQ) scan converter-based satellite station. The 512K Radio Shack Color Computer 3 (lower center) handles the imaging chores in conjunction with Jack's version of the WSH scan converter in the cabinet on the left side of the middle shelf. The cabinet at the center of the middle shelf contains the station power supply and the station antenna control while the Hamtronics R75A custom-packaged kit receiver is on the right. The upper shelf has two monitors, one for the computer menu (left), and the other to view the output of the scan converter, like the large-screen monitor to the right of the shelf unit.

A roof-mounted antenna was out of the question for a number of reasons. The most important of these is that I live in a 100+ year old Victorian house and I won't get up on most of the roof in the summer, let alone in the dead of winter! For a long time I did dream of having the antenna a good deal closer to home, if only to let me keep my converters in the more benign environment of the house! About two years ago I opted for a new approach to mounting a dish, an approach which might be applied by any of you, if you have a window or wall that faces in approximately the right direction for a particular geostationary spacecraft.

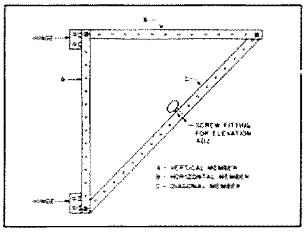

Fig. 1(a). Side-view sketch of a dish antenna mount constructed of perforated steel angle stock for window or wall mounting of a WEFAX dish.

The mount is designed to mount on a wall or window frame while providing complete freedom of azimuth adjustment over almost 90 degrees. The main component is a triangular frame, shown in sketch form in Fig. 1(a). The frame itself is made of punched steel angle stock, available at most hardware stores. A stock length for this material is three feet and the vertical and horizontal members are made up of single pieces of angle stock.

The longer diagonal member is made from two pieces, doubled over most of their length. The triangle is simply bolted together using 1/4-inch hardware and no drilling is required since the angle stock is punched every inch on both sides.

The vertical member has two heavy-duty hinges bolted on, one at the top and one at the bottom. These hinges in turn are bolted to the window frame or wall, enabling the frame to swing like a gate, through an arc of over 90 degrees. The antenna, a Metsat GR-4 in my case, has a horizontal mounting tube at the back, and this tube is secured to the horizontal arm of the triangle using "U" clamps. The clamps provide a secure attachment yet permit the dish to pivot on the mounting tube for elevation adjustment.

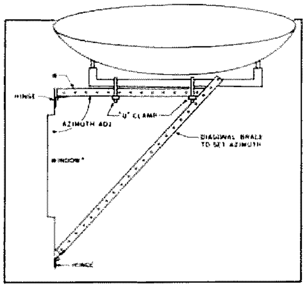

Fig. 1(b). Top view of the dish antenna mount showing the azimuth brace.

Elevation is controlled by a 1/2-inch threaded rod from the lower edge of the dish that runs up into a fitting installed on the angled member of the triangle. The fitting is a heavy-duty eye bolt with stop nuts on either side of the rod that passes through the eye. The length of threaded rod controls the elevation of the dish while the adjustable angle of the hinged triangle provides the needed azimuth adjustment. Once determined, the azimuth setting is maintained by another piece of angle stock running from the outside end of the horizontal member to another hinge mounted on the opposite side of the window frame or a few feet further along the wall—Fig. 1(b). If this piece is cut slightly longer then necessary, once initial bearings are determined you have the capability of readjusting azimuth in small increments should the spacecraft of interest be repositioned at some future point.

The mount, with antenna, is shown in Photo A. The antenna now hangs neatly on the side of the house, well away from curious hands, yet is easily accessible for adjustment, if required. A GaAsFET preamp mounts at the feed on the rear of the dish and the signal is carried inside the house on a 20-foot length of Belden 8214 RG-8 foam coax. The converter is inside with the RG-58 i-f cable running down to the basement station site. If I were willing to invest in a 100-foot run of Heliax™ or other low-loss cable, I could probably run the signal directly to the basement, but that is not necessary in this case.

This approach to antenna mounting is a good alternative where ground-mounted antennas are out of the question due to poor look angles (trees, etc.) or where security is a problem and where roof mounting is impractical. This particular mount has been up for over two years with no problems and has withstood windstorms that have taken out local amateur and TV antenna installations.

Picture of The Month

This picture is one of a set that was provided by Jack Hawkins of San Bernadino, California. Jack, who turns out to be quite a craftsman, has spent the last six months putting together a beautifully matched set of gear including a power supply/antenna control unit, a nicely packaged Hamtronics receiver, and the WSH scan converter using the 512K CoCo 3 and my Version 4 software package on EPROM.

Jack had some very complimentary things to say about the scan converter, but modesty forbids me going into great detail. Suffice it to say that he loves it and is still amazed that it all went together with minimal hassle!

Well, that's about it for this month. Next month we are going to embark on a two-part series looking at a project that marries both scan converters and FAX into a new, integrated image display system. You are going to like this one!

New Datalink BBS Service Number

The very fine bulletin board, operated by Jeff Wallach for the benefit of a wide range of satellite enthusiasts, is going strong and providing an ever-widening database. Many weather satellite buffs have checked in and joined up since I first included the number in the January column. The number has been changed to (214) 394-7438 (however, calls to the old number are still being transferred). You will, however, want to update your communications file software.■

FUN!

John Edwards KI2U
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THE HAM'S ALL-PURPOSE, ON-THE-ROAD SURVIVAL KIT

Ah, a ham's life isn't easy. A DXpedition to a desert island one month, VHF contesting on a mountaintop the next. Over the years, while on the road, hams have been sunburned, frozen, bitten, scratched, mauled, scraped, crushed and, in some instances, even shot at.

Yes, indeed, an easy life it ain't. I don't know if Indiana Jones was a ham, but it wouldn't surprise me one bit. He has that look of a hard-boiled, cynical DXpeditioner. Just by looking at his face you can tell that Ol' Indy must have shouldered his way through infinite pileups back in the days of tubes and amplitude modulation.

Being a bit of an adventurer myself, I know it pays to plan wisely when heading out into the ham's wide world. So whenever I hit the road, I take along my ham's survival kit. I realize I'm not the only ham who carries along a goodie bag on his jaunts around the world, but I happen to believe that my kit is exceptionally well-stocked, containing just about everything necessary for any possible emergency. To wit:

☐ **Throat Spray:** This is a necessity. I mean, if you can't talk, you can't ham, right?

☐ **Liniment:** To rub on your hand. I mean, if you can't pound brass, you can't ham, right?

☐ **Money:** It's amazing the things you can still do with U.S. currency. For example, it's quite handy for bribing various overseas officials who may not quite understand what you're doing with all of that funny-looking equipment in your luggage. It's remarkable stuff. Highly recommended.

☐ **Insect Repellent:** An obvious accessory when visiting tropical places, but handy in northern climates as well—even in winter. After all, you never know what sort of a hotel you'll be staying in.

☐ **Calculator:** I don't care what sort of a math whiz you think you are, bring along a calculator. In fact, the more exotic the land you're visiting, the more you'll need it. It can be murder on the brain totaling up all those QSOs.

☐ **Portable Computer:** If you have the room, substitute a laptop computer for the calculator. The PC will help you log contacts, retrieve urgent messages from your wife and children (Daddy! Come home! We need you!) and kill the dull hours between band openings with its games. Personally, I like Toshiba's laptops, but the Tandy models are good, too. To each his own.

☐ **Mini-Flashlight:** Truly a tool with 1,001 uses. Ever try to troubleshoot a final amp in the field on a dark, rainy night? Without a mini-flashlight, the only available illumination will be your body as all those amps go flowing through it.

☐ **Swiss Army Knife:** Truly a tool with 1,000,001 uses: stripping coax, tightening antenna screws and opening stubborn beer cans are only a few of its applications. Just be sure it's a Victorinox and not one of those babies you see advertised in the Sunday newspaper supplements (they rust).

> ***"I don't know if Indiana Jones is a ham, but he has that look of a hard-boiled, cynical DXpeditioner."***

☐ **Pocket Camera:** (Or better yet, a 35mm camera.) What good is a DXpedition or contest venture without permanent documentation? I mean, who's going to believe you ever went on your little journey if you don't have photographs to prove it? How are you going to bore the guys down at the club if you don't show up with a few hundred slides? How are you ever going to get your mug in the ham magazines without a camera? Think about it!

☐ **Camcorder:** If you're into high-tech consumer electronics, bring one of these along. The VHC/C and 8mm models are the most compact and the only ones really worth fooling around with. A camcorder won't put your face in a magazine, but the tapes it generates will bore your buddies even better than your camera's slides.

☐ **Mirror:** After your boat sinks, and you're stuck on some godforsaken raft, you use this to signal for help. You know, in Morse code, the way all pro-code advocates advise.

☐ **Binoculars:** Good for spotting the rescue plane when it finally does arrive. (See? The mirror worked!)

☐ **Sunglasses:** A must in the tropics or arctic, a big help anyplace else. After all, you're going to be doing a lot of squinting at log sheets, meters, and the like, so treat your eyes with kindness. They're also helpful for covering up the effects of last night's beer blast. Good, too, for eyeing girls on the beach.

That's about it. You may have a few other items you'll want to toss in (soap, toothpaste, shaver, deodorant, etc.), but that's up to you. Many hams don't necessarily regard cleanliness as a DXpedition virtue.

I'll also leave the kit's housing up to you. I use a couple of Hartmann briefcases, but you may want to use that Antenna Specialists plastic bag you got at Dayton a few years back.

See you on the airport courtesy bus! ■

BARTER 'N' BUY

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 80-page catalog, $5. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90815. BNB045

MARINE RADIO: Marconi Canada CH-125 synthesized AM/SSB transceiver, 22 channels on 4, 8, and 12 MHz, 125 Watts, 12 V dc. Never used, list $1,995, asking $1,495. Stu Norwood, 70 Rte. 202 North, Peterborough NH 03458. BNB047

QSLs to order. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

THE DX'ERS MAGAZINE. Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DXCC Honor Roll Certificate 2-4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

XEROX MEMORYWRITER—parts, assemblies, boards, manuals. Free help with service problems. W6NTH, Box 250, Benton AR 72015; (501)-776-0920. BNB404

HAM TRADER YELLOW SHEETS, in our 24th year. Buy, swap, sell ham-radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. $12 for one year (24 issues). PO Box 2057, Glen Ellyn IL 60138-2057. BNB412

QSL CARDS—Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, Dept. A, 310 Commercial, Emporia KS 66801. BNB434

YAESU OWNERS—Hundreds of modifications and improvements for your rig. Select the best from 14 years of genuine top-rated Fox-Tango Newsletters by using our new 32-page Cumulative Index. Only $5 postpaid (cash or check) with $4 rebate certificate creditable toward newsletter purchases. Includes famous Fox-Tango Filter and Accessories Lists. Milt Lowens N4ML (Editor), Box 15944-S, W. Palm Beach FL 33416; (305)-683-9587. BNB448

FIND OUT what else you can hear on your general-coverage transceiver or receiver. Join a shortwave radio listening club. Complete information on major North American clubs and sample newsletter $1. Association of North American Radio Clubs, PO Box 462, Northfield MN 55057. BNB464

WANTED: Old Western Electric, RCA, Telefunken, Mcintosh, Marantz, Dynaco, Tannoy, Altec—tubes, amplifiers, speakers. Maury Corb, 11122 Atwell, Houston TX 77096; (713)-728-4343. BNB479

LEARN CODE on your IBM PC (or compatible), Commodore C-64/128, or 512K Macintosh. CODE-PRO takes you from no knowledge to proficient copy. Specify computer. $10 plus $2 s&h. Trio Technology, Dept. 861, PO Box 402, Palm Bay FL 32906. BNB490

ELITE+ CODE PROGRAMS. APPLE II+/c/e/GS. C-64/128. 37 modes. Graphics; Wordprocessor; Menus; Lessons; Speed Techniques: Drill, Practice, Print, Teach, View Modes; 1-100 WPM; Variable Sound, Character, Word Spacing; and more. $49.95. Check/MO. COD's add $2, Other Versions $14.95-44.95. $3.50 Demo Disk gives $2 off next purchase. Write: LARESCO, POB 2018, 1200 Ring Road, Calumet IL 60409; (312) 891-3279. BNB507

Barter 'N' Buy advertising must pertain to ham radio products or services.

☐**Individual (noncommercial)** .... **25¢ per word**
☐**Commercial** .... **60¢ per word**

Prepayment required. *Count only the words in the text. Your address is free. 73* cannot verify advertising claims and cannot be held responsible for claims made by the advertiser. Liability will be limited to making any necessary corrections in the next available issue. Please print clearly or type (double-spaced).

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No discounts or commissions are available. Copy must be received in Peterborough by the fifth of the second month preceding the cover date. Make checks payable to *73* Magazine and send to: **Hope Currier, *73* Magazine, WGE Center, Peterborough NH 03458.**

HOME-BREW PROJECTS LIST. SASE WB2EUF, PO Box 708, East Hampton NY 11937. BNB509

VIDEOCIPHER DESCRAMBLING MANUAL—115 pp.—$27.45 ppd. Oak Orion—77 pp.—$22.45 ppd. Satellite catalog $2. Microtronics, PO Box 2517-L, Covina CA 91722. BNB513

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $10. Moneyback guarantee. Bahr, Dept. 73-4, 2549 Temple, Palm Bay FL 32905. BN517

COMMODORE CHIPS. We are an Authorized Distributor and guarantee factory-fresh, low-priced chips. 6526/6510-$9.95, 6581—$12.85, 6567—$14.75, 8701—$7.25, PLA/82S100—$12.50, 901225/226/227/229-$10.95 and many others. Ask about user group-quantity pricing. 24-hour delivery . . . "THE COMMODORE DIAGNOSTICIAN", newly-released, laminated chart for diagnosing faulty IC's on C64/1541. A must for those who want to do their own repairs and save money and down time. Reference Aid #4 $6.95. Reference aid #5 for C128 $7.95 (plus postage) . . . Heavy Duty Power Supply for the C64 $27.95 . . . Call toll free, (800)-642-7634 (outside NY), or (914)-356-3131. Kasara Microsystems, Inc., 33 Murray Hill Drive, Spring Valley NY 10977. BNB529

QSLs, QSLs, RUSPRINT QSLs. Quantities of 100, 200, 300, or more. Full color Old Glory and cartoon. Also Parchment, Golden Eagle, and others. SASE appreciated. Rusprint, Rte. 1, Box 363-73, Spring Hill KS 66083. BNB532

NI-CD BATTERIES AA/AAA $1.50 (W/Tabs &1.65) each. 7-cell replacement pack to fit ICOM BP-3 case $14.95 each. Cells for BP 2-5&7 $2.40 each. Yaesu FNB-2 "Clone" Pack $22.95 each. PA residents add 6%. Add $2.00 S&H/order. Others available, write: CUNARD ASSOCIATES, R.D. 6, Box 104, Bedford PA 15522. BNB557

HAM RADIO REPAIR, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128; (408)-729-8200. BNB558

NJ—NJ—NJ—NJ—NJ—NJ—NJ—NJ—FINALLY!! A ham—SWL—CB—scanner store in N.J. Discount grand opening prices. Top performing radio systems for every budget. New 10-meter and VHF/UHF rigs. Antenna Specialists, ARRL, Astatic, Azden, B&W, Belden, Bilal, Butternut, Clear Channel, Daiwa, Diamond, Kenpro, Kenwood, KLM, Larsen, Mirage, Nye, Santec, Sanyo, THL, Yaesu, Welz, much more. Open M—F 10 a.m.-9 p.m., Sat. 10 a.m.-7 p.m. Have qualified repair facility. Abaris Systems, 276 Oriental Pl., Lyndhurst NJ 07071; (201)-939-0015. BNB560

THE DX BULLETIN provides you with comprehensive, up-to-date DX information and much more. SASE or call for samples. Box 4233W, Santa Rosa CA 95402; (707)-523-1001. BNB565

1987 "BLOSSOMLAND BLAST" Sunday, September 20, 1987. Write "Blast," PO Box 175, St. Joseph MI 49085. BNB569

WANTED: EQUIPMENT AND RELATED ITEMS. THE RADIO CLUB OF JUNIOR HIGH SCHOOL 22 NYC, INC., is a nonprofit organization, granted 501(c)(3) status by the IRS, incorporated under the laws of the state of New York with the goal of using the theme of Ham Radio to further and enhance the education of young people. Your property donation would be greatly appreciated and acknowledged with a receipt for your tax-deductible donation. Please contact WB2JKJ through the *Callbook* or telephone (516)-674-4072, 24 hours, seven days a week. Thank you! BNB570

CARDS. Free samples. Cards printed on glossy white stock. Ken WA9HGE, 1075 W. 11th Street, Hobart IN 46342. BNB574

CUSTOM LEATHER RADIO CASES for all makes of HTs/scanners. Free info. Alexander, Box 1556, Kitchener Ontario N2G 4P2 Canada. BNB577

THE ORIGINAL HAM SACK. Deluxe soft padded case for all popular handhelds with battery packs. Three zippered compartments for radio, antenna, and accessories including spare battery pack. Belt loops and detachable shoulder strap. Tough Dupont Cordura™ nylon. We are hams and we *know* you will like this case. Full refund guarantee. $12.50 includes shipping. Frank & Linda Reed KC1DM & N1EUR, 15C Daniel Webster Dr., Hudson NH 03051. BNB580

SB-220 OWNERS!—Enhance performance—add new features. 11 step-by-step mods which include: tuned-input 6- and 160-meter operation, heavy-duty power supply mods, full QSK operation, solid-state bias control, and many more. Source of parts included. One time 50% rebate for new mods submitted and two free updates. 10 pages of tech info on the 3-500Z. Order today—$10 per copy plus $1 postage. SASE for info. Bob Kozlarek WA2SQQ, 69 Memorial Place, Elmwood Park NJ 07407. BNB581

MORSE CODE COACH—IBM PC. 32 lessons included, create and save more. Random code groups also. Novice to Extra speeds. Practice at 16-wpm rate spaced to speed, or test at speed. Menu-driven with Help. Basic—source included. Send $15 for floppy. G. Leedom KB6NKC, Rt. 5, Box 441, Chippewa Falls WI 54729 BNB585.

COMMODORE REPAIRS. We are the largest service center in the country and we repair your Commodore computer within 3 to 4 days. (Our prices are

low: e.g., C64—$39.95). C64 Power Supply for August only $24.95. Call Toll Free (800) 642-7634 (outside NY), or (914) 356-3131. Kasara Microsystems, Inc., 33 Murray Hill Drive, Spring Valley NY 10977. BNB587

WANTED: Lafayette PrivaCom 3C, 525, 625, or GE 5813B. RADIO, 2053 Mohave Dr., Dayton OH 45431. BNB589

CHRISTIAN INVESTIGATOR NET Write N9FAQ Blau, 1127 West Hwy 20, Michigan City IN 46360. Three stamps, please. BNB590

STAMP-COLLECTING HAM wants foriegn stamps and stamped envelopes. Donna Kappenman KE0HP, 516 Melrose, Souix Falls SD 57106. BNB591

FREE HAM CATALOG. SASE. Bahr, Dept. 73-4, 2549 Temple, Palm Bay FL 32905. BNB592

WANTED: W.W. II, BC-654 transceiver and PE-103 dynamotor. Ernest Bircher, 108 Troy Dr., Slidell LA 70461; (504) 649-7425. BNB593

SWAP: Ham Radio Club patches. Simple: you send me yours; I return mine. Chuck Martin F/AB4Y, CPU A-316, APO New York NY 09777. BNB594

WANTED: Military radios and related equipment. Circa: WW II. Command and Field Issue. ARC-2, BC375, BC223, Etc. Complete Collections or Single Sets. Contact: KA1GON; (617) 396-9354 or write: 501 Mystic Valley Pkwy, Medford MA 02155. BNB595

WANTED: DRAKE DSR-2 Communications Reciever Model 1242, (nixie display) in good unmodified condition. Will pay extra for excellent or mint condition. Please write to: Richard B. Powell, 228 Hibiscus Court, Newmarket, Ontario L3Y 5K9, Canada, or call (416) 474-2494 (days). BNB596

2M/1.25M/70CM TRI-BAND MOBILE ANTENNA. Austin Metro Mobile provides three band operation single 15-inch vertical atop car. $62.45 with magnet mount. Ed. Noll W3FQJ, Sales Rep., P.O. Box 75, Chalfont PA 18914. BNB597

CONTESTERS! Send in your log score with general purpose contest entry forms. 70 spaces. $19/100, post paid. Free info: Mr. Moist, Box 2143, Elko NY 89801. BNB598

SPECIAL EVENTS

JACKSON HOLE WY
JUL 31–AUG 2

The 55th annual Wyoming, Idaho, Montana, and Utah Hamfest will be held at the Virginian Lodge, Jackson Hole, Wyoming. Talk-in will be on 146.52 MHz simplex. Tickets are $10 at the door. Contact: WIMU87 Hamfest, Inc., c/o Cheryl Ransom KA7QE, HC36-2035, Riverton WY 82501-9354; (307) 856-1811.

EAA AVIATION EXHIBITION
AUG 1–2

The Fox Cities ARC will operate W9ZL from 1300–2100Z August 1–2 in conjunction with the 35th annual EAA International Fly-In Convention and Sport Aviation Exhibition. Frequencies: 7.240 and 14.240. QSL: QSL and SASE to Ade Vanderburgt K9DHR, 264 Evergreen Dr., Kaukauna WI 54130.

CEDAR RAPIDS IA
AUG 1–2

The Cedar Valley ARC is sponsoring their Summerfest 87 at the Cedar Rapids Five Seasons Center from 8 a.m. to 5 p.m. August 1 and from 8 a.m. to 3 p.m. August 2. Talk-in on .16/.76 and .52. Features: amateur radio and computer seminars, FCC exams, commercial vendors, and a flea market. A buffet dinner will be held Saturday night. Fees: tables $10; commercial $20 per booth, $15 each thereafter. Admission: adult $5 advance, $6 at door; student $3 advance, $4 at door; 12 and under free. Banquet: $10 advance, $13 at door (if available). Contact: Summerfest 87, 2825 23rd Ave., Marion IA 52302; (319) 377-2761 or (319) 362-3602.

TWINS DAY CELEBRATION
AUG 1–2

The Cuyahoga ARC will operate K8ZFR and member stations at the annual Twins Day Celebration from 1700–0100Z August 1 and from 1700–2000Z August 2. Frequencies ± 20 kHz. Phone: 3.870, 7.245, 14.245, 21.320, 28.440; CW: 3.600, 7.050, 14.050, 21.050; Novice: 15, 40, 80 meters. Special QSL: QSL and SASE to C.A.R.S. Twins Day, P.O. Box 357, Twinsburg OH 44087.

ANGOLA IN
AUG 2

The Steuben County ARC presents the 28th annual FM picnic and hamfest 2 August at Crooked Lake. Talk-in on 146.52 and 147.81/.21. Features: picnic-style BBQ chicken, exhibitors, and vendors. Admission $2.50.

BERRYVILLE VA
AUG 2

The Shenandoah Valley ARC will sponsor the 37th Annual Winchester Hamfest on August 2, from 7 a.m. to 3 p.m. at the Clarke County Puritan Fairgrounds, Route 7, two miles west of Berryville, Virginia. Talk-in on 146.22/.82 or .52. Fees: admission $4, children under 12 and wives free; tailgating and limited tables, $5. VE exams at 9 a.m. (limited walk-ins—must register by 8:30 a.m.). Contact: Rob Kinsley NT4S, (703)-869-5113; or SVARC, PO Box 139, Winchester VA 22601.

COLUMBIA TN
AUG 2

The Maury ARC is sponsoring its first indoor annual hamfest 8 a.m. to 4 p.m. at American Legion Post 19, New Nashville Highway, Columbia TN. Talk-in on 147.72/.12. Refreshments. VE license exams. Fees: admission $2; tables $5. Contact: George Russell WB4JCR, Box 832, Columbia TN 38402; (613) 388-0577.

FISHERS ISLAND SOUND NY
AUG 2

The Tri-City ARC will mount its fourth annual expedition to Flat Hammock Island in Long Island Sound on Sunday, 2 August. KA1BB will operate from 1300–2000Z in the lower 20 kHz phone and CW 40, 20, and 15 meter bands and (hopefully) the center of the 40 meter Novice band. QSL: Tri-City ARC, P.O. Box 686, Groton CT 06340. Contact: Bob Darfel KA1BB, 8 Willow Lane, East Lyme CT 06333; (203) 739-8016 or (203) 446-7325.

VALPARAISO IN
AUG 2

The Porter County ARC presents the Northwest Indiana Hamfest and Computer Fair Sunday, August 2 at the 49'er Drive-In Theater, Route 9, north of Valparasio, Indiana. Talk-in on 146.775/.175 MHz and 145.45/144.950. Gates open at 7 a.m.; 6 a.m. for vendors. Admission: $3.50 per person (under 12 free). Contact: Rich Stahl K9LBO, P.O. Box 1782, Valparasio IN 46383.

WEST MIFFLIN PA
AUG 2

The 50th Golden Hamfest of the South Hills Brass Pounders and Modulators ARC of Pittsburgh PA will be held on August 2 on the south campus of Community College of Allegheny County in West Mifflin PA. Talk-in on 146.13/.73 or 146.52. Special-event station frequencies to be announced. Contact: Doug Wilson WA2ZNP, 185 Orchard Avenue, Emsworth PA 15202.

CANTON OH
AUG 3–7 and AUG 8–9

The Canton ARC will operate special event station W8AL to celebrate the Pro-Football Hall of Fame Greatest Weekend August 3–7, 2200–0200 UTC and August 8–9, 1700–2300 UTC. Frequencies: SSB 7.270 14.270; CW 7.060 14.060. RTTY and Novice operation possible. Unfolded certificate: QSL and 9x12 SASE with 2 units of first class postage; folded certificate: QSL and SASE #10 to Randy Phelps KD8JN, 1226 Delverne Ave., SW, Canton OH 44710.

AUSTIN TX
AUG 7–9

The Austin ARC and the Austin Repeater Organization are sponsoring the Austin Summerfest August 7–9 at the Villa Capri Motor Hotel, 2400 North Interstate 35. The event hosts the summer meeting of the Texas VHF-FM and is also the ARRL West Gulf Convention. Features: flea market, dealer exhibits, ARRL forum, technical program, transmitter hunt, VE exams for all classes, barbeque, and Wouff Hong ceremony. Fees: pre-registration $5, $7 at door, under 15 free. Barbecue: $9 (requires pre-registration). Swapfest tables: $5 each (limit three). Contact: Joe Makeever (512) 345-0800.

INDIANAPOLIS IN
AUG 7–23

Station W9PAX (W9 Pan American Ten) will be operational during the Tenth Pan-American Games being held in Indianapolis August 7–23. The special event station will begin operation on an unscheduled basis during May, and will be operational from 0001 UTC, August 1 to 2359 UTC, August 23. Operation: 30 kHz up from the bottom of each band, 1.8–28 MHz for CW. SSB around 1.850, 3.850, 7.250, 14.250, 21.350, and 28.550. QSL: QSL and SASE to W9PAX, Box 18495, Indianapolis IN 46218-0495 USA. Certificate: for working W9PAX on three different bands; working W9PAX once and one station from any three of the participating Pan-American nations; or working W9PAX once and three Indiana stations. Certificate: QSL, SASE, list of contacts, call, date, and time to same address. Contact: Cornelius M. Head WB9ZQE, 9046 Mercury Dr., Indianapolis IN 46229; (317) 263-5281 or (317) 898-2792.

AMARILLO TX
AUG 8–9

The Panhandle ARC's 13th Annual Golden Spread Hamfest will be held at the Quality Inn of Amarillo, 601 Amarillo Blvd. West beginning at 9 a.m. both Saturday and Sunday. Fees: pre-registration $5, at door $6; tables $5 each. Features: VE testing, commercial distributors, dealers, and flea market. Contact: PARC Hamfest, Box 10221, Amarillo TX 79116.

ESSEX JUNCTION VT
AUG 8–9

The Burlington ARC will hold its annual hamfest on August 8–9, all day both days, at the Champlain Valley Fairgrounds in Essex Junction VT. Talk-in on 146.34/.94. Fees: admission $4 U.S. or $5 Canadian, under 12 free. Contact: Barb Kimball N1DLE, 1 Sundown Dr., Williston VT 05495; (802)-878-5555.

GLENWOOD SPRINGS CO
AUG 8

Ski Country ARC will host its 6th Annual Hamfest in conjunction with the Colorado Council of ARC summer meeting at the CMC Building, 1402 Blake Avenue from 9 a.m. to 3 p.m. Talk-in 146.07/.67. Free admission. Fees: tables $5. VE exams 9 a.m. Features: videotapes, packet and AMSAT demos, HF station on air. Contact: Bob Ludtke K9MWM, 406 Yale Circle, Glenwood Springs CO 81601; (303) 945-8722.

FLEURIMONT QUEBEC
AUG 9

Fleurimont, Quebec celebrates its 50th anniversary. Station VE2FMA will operate August 9 1400–0200 UTC on bands 14.155 and 3.765 MHz ± QRM. Certificate: before September 9; SWLs welcome. Certificate Information, VE2FQX, 1866 ch. Galvin Fleurimont, Quebec, Canada J1G 3G1.

GEORGETOWN KY
AUG 9

The Bluegrass ARS is sponsoring the Central Kentucky ARRL Hamfest Sunday, August 9 from 8 a.m. to 4 p.m. at Scott County High School, Longlick and U.S. Route 25 in Georgetown. Talk-in on 146.16/.76 repeater. Features: technical forums, license exams, commercial exhibits, and flea market. Fees: $5 in advance, $6 at gate. Contact: Bill DeVore N4DIT, 112 Brigadoon Parkway, Lexington KY 40503.

IN
AUG 9

The 8th annual Grant County ARC hamfest will be held at the 4-H Fairgrounds, Sunday, August 9 beginning at 8 a.m. Fees: $3 advance, $4 at gate. Tables: $4 inside, $2 flea-market. Contact: SASE to Brooks Clark WB9EAP, 2202 South Boots St., Marion IN 46953.

ST. CLOUD MN
AUG 9

The St. Cloud ARC Hamfest is being held August 9 at the Whitney Senior Citizens Center. Talk-in on .34/.94 primary, .615/.015 secondary. Fees: $3 first ticket, $2 additional tickets. Contact: SCARC, Box 141, St. Cloud MN 56302.

WARRINGTON PA
AUG 9

The Mid-Atlantic ARC is holding its annual hamfest from 8 a.m. to 3 p.m. at the Bucks County Drive-In, Route 611, Warrington. Talk-in WB3JOE/R, 147.66/.06 or 146.52. Fees: $3 admission, $2 each tailgate space. Contact: John Bartholomew WB3ELA, MARC, 203 Second Ave., Broomall PA 19008; (215) 356-7197.

WILLOW SPRINGS IL
AUG 9

The Hamfesters Radio Club is holding its 53rd annual hamfest at Sante Fe Park (91st and Wolf Rd.). Features: vendors, ARRL and FCC tables, refreshments. Fees: $3 in advance, $4 at gate. For tickets: check and SASE to John Schipitsch W9BNR, 13058 Finch Ct., Lockport IL 60441. General information: (312) 403-1043.

AKRON OH
AUG 10–15

Special events station W8VPV will be operated at the All-American Soap Box Derby by the Cuyahoga Falls ARC Monday–Friday, 2200–0300Z and Saturday, 1100–2000Z. Frequencies: 3.860, 7.230, 14.240, and 28.420. Certificate: Large SASE to W8VPV, P.O. Box 614, Cuyahoga Falls OH 44222.

SPANISH FORK UT
AUG 12–15

Constitutional Commemorative Rendezvous Encampment. The Utah County ARES and the Utah National Parks Council will be operating station K2BSA/7 from 1800Z, August 12 to 0600Z, August 15. Frequencies: CW: 7.040, 7.125, 14.040, 21.040, and 21.140; phone: 7.245, 14.270, and 21.310. Commemorative QSL: SASE to NR7P, 376 North 520 West, American Fork UT 84003.

GREEN BAY WI
AUG 15

The Green Bay Mike and Key Club's Summer Swapfest is being held at the Community Service Center, 1673 Dousman St. beginning at 7 a.m. (sellers 6 a.m.). Talk-in on 147.72/.12 and 147.96/.36. Fee: $1 admission. Features: electronic equipment, components for hams, computer hobbyists and experimenters, old-time radio, and more. Tables: (by reservations only) $5; send SASE with name, call, address, and check to: Green Bay Mike & Key Club, c/o Cathy Strommen KD9WO, 1500 Main St., Green Bay WI 54302. Testing: pre-register by July 15, walk-ins accepted (must have original license and photo I.D.); Contact: Larry Siebers KD9IA, 7077 Weyers Rd., Freedom WI 54130; (414) 788-3823.

POMONA CA
AUG 15

The Tri-County ARA 1987 Hamfest will be held on August 15, from 7 a.m. to 3 p.m. at Palomares Park at Arrow Highway, in Pomona. Fees: tables non-members $5, members $2. FCC exams given by Frank Westphal KF6E. Contact: Eugene Hoelzle K6PMC, 1071 Vanderbilt, Claremont CA 91711; (714)-624-6382.

RHINELANDER WI
AUG 15

The Northwoods ARC/ARES is sponsoring the 1987 Swapfest at South Park School beginning at 9 a.m. Talk-in on 146.34/.94. Fees: $1 admission. Contact: Len Bauman K9RMN, 1312 Dorothy St., Rhinelander WI 54501; (715) 369-3296.

HUNTSVILLE AL
AUG 15–16

The Huntsville Hamfest and the ARRL Alabama State Convention will be held at the Von Braun Civic Center, 700 Monroe St. from 9 a.m. to 5 p.m. August 15 and 9 a.m. to 3 p.m. August 16. Talk-in on .34/.94. Fees: free admission, parking $2, amateur exams $4 (bring copy of license, identification with photo). Contact: Gwin Givens (205) 883-2760 or Don Tunstill (205) 536-3904.

PIPERSVILLE PA
AUG 15–16

The South Jersey Radio Association K2AA will operate from 1400Z August 15 to 2100Z August 16 to help commemorate the 75th Anniversary of the Sea Scouting Program of the Boy Scouts of America. Frequencies: Low end of 75, 40, 20, and 15 meter general phone bands and 10 meter Novice band. QSL: SASE to SJRA, P.O. Box 1026, Haddonfield NJ 08033.

GEORGETOWN DE
AUG 16

The 3rd Annual Delmarva Hamfest will be held at Delaware Community College, Del 18 from 8 a.m. to 4 p.m. Talk-in 147.075. Exams offered. Fees: inside tables $5; tailgate space $3. Contact: Delmarva Hamfest, Route 2, Box 244G, Georgetown DE 19947.

LAFAYETTE IN
AUG 16

The Lafayette Hamfest will be held at the Tippecanoe County Fairgrounds, opening at 5 a.m. Indoor set up 5–8:30 p.m. Saturday, August 15. Contact: Michael Collison KA9IHB, 111 South 7th St., Lafayette IN 47901-1628.

RICHMOND CA
AUG 16

The East Bay ARC will commemorate its 40th anniversary and annual picnic operating W6CUS 1900–2300Z August 16. Frequencies: SSB 7.290, 14.430; CW 7.125, 14.065 MHz. W6CUS-1 triple port connections will be accepted from 1500–18:00Z on 7.093, 144.97, and 223.58 MHz. Commemorative Certificate: QSL and SASE to EBARC, Inc., P.O. Box 1393, El Cerrito CA 94530 by October 16. ■

QRP

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

QRP AND TEN-TEC

Last month we talked about the Heath series of QRP radios. This month we'll take a close look at Ten-Tec, a company which some people call "The Cadillac of QRP."

Ten-Tec was founded in 1968 by Albert Kahn K4FW and Jack Burchfield K4KU. The first products they sold were small electronic modules for the home builder. Those modules were so successful that Ten-Tec built up a small, low-powered transceiver called the PM2. The PM stood for "Power Mite." The PM2A and PM3 followed, each one better that the first. As with most equipment building, model changes brought on new ideas. The Power Mites were very simple. They had direct-conversion receivers and sported about 2 Watts of output. Most covered the 80- and 40-meter bands while different models covered the 40-, 20-, and 15-meter bands. Dial calibration was especially crude. You knew you were on the 40-meter band—somewhere.

Not long after the PM-series transceivers were on the market, Ten-Tec introduced the Argonaut. The first model, the Argonaut 505, was an instant hit with low-power operators. The 505 was the first low-powered transceiver that offered SSB. For the CW operator, the Argonaut's QSK, or full break-in operation, would become the standard for the entire industry to follow. The Argonaut's small size and weight allowed the unit to be portable. With the diet-like demand for power the Argonaut 505 could operate for days on end with just two six-volt lantern batteries.

The 505 had some bugs, however. The lack of reverse-polarity protection led to so many rigs being smoked that Ten-Tec packaged up a complete kit to replace cooked components. For some strange reason, Ten-Tec decided to place the drive/gain control on the rear panel. This proved a rather unpopular spot for a much-used control. The ten-meter band was all lumped together on one spread. Tuning on ten was a real chore.

On the used market, a good, clean Argonaut 505 should go for about \$100–\$180 depending on accessories. The crystal calibrator and the outboard audio filter should be considered in the selling price.

Most of these problems were solved with the introduction of the Argonaut 509. The 509 has become the de facto standard of QRP transceivers. With the drive control located on the front panel and the reverse-polarity protection built into the transceiver, all seemed right with the world. The 509 has a better receiver than the 505 and sports a different power amplifier. Many a Field Day has seen an 509 under the tent.

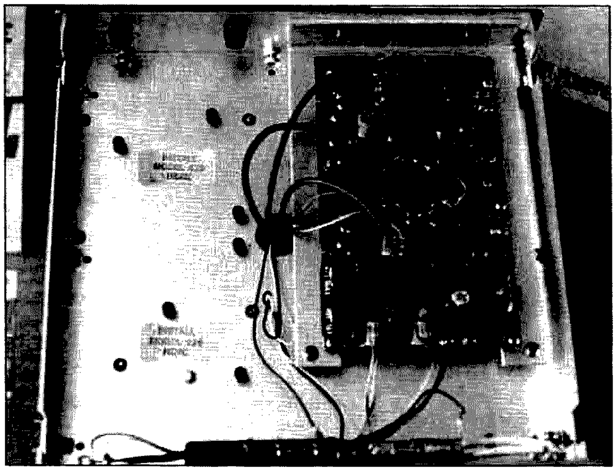


Photo A. Inside the Century 22. All that open space is for crystal calibrator and keyer options.

On today's used market price, look to fork out anywhere from \$120–\$200. Again, this depends on the condition of the unit and its accessories.

It would seem hard to improve on the 509, but Ten-Tec did just that with the Argonaut 515. I like to think the 515 was built out of leftover Triton 4 parts. There was a second improvement in receiver design. The transmitter was changed once more. Finally, the entire ten-meter band was spread out over four different bands. Gone with the 515 was the familiar eggshell-white color case. The newer bronze color replaced the old standby. The CW filter, while still outboard, had evolved into a notch filter and audio filter in one unit. The small tuning dial was replaced with a larger one for a better feel. Ten-Tec made only about 800 of these units. As a result, the price for a used 515, if you can find one, can be quite high. Plan to spend a long time looking in the flea markets. You may have to lay down up to \$200–\$350 for one.

While the 509 was still in production, Ten-Tec was able to place into the market a 100-Watt solid-state amplifier, the model 405. This was a matching amplifier for the Argonaut. It would take the 2-Watt input and dump out 50 Watts to the antenna. While we don't think much of this today, this was quite something 11 years ago. With the FCC ban on ten-meter amplifiers, Ten-Tec was forced to remove the 405 from the market. Consequently, a used 405 can cost almost as much now as it did when the unit was new. I have seen the model 405 go for \$150.

With the Argonaut 515 discontinued, one would think that would be the end of the story. Ten-Tec was busy all this time, however, building a transceiver called the Century 21. This radio was designed for the newcomer to ham radio. With several advanced features, the radio soon found its way into the shacks of dedicated CW ops. The Century 21 was a rather large radio. Large easy-to-use knobs for the controls along with an open panel layout made operation exceptionally easy. The Century 21 came with its own built-in power supply. As the unit came from the factory, you could not connect up an external 12-volt supply. There is a simple fix for this problem, and many a 21 has seen duty during Field Day.

The Century 21 uses a double direct-conversion receiver. The solid-state power amplifier will produce about 45 Watts of output. The Century 21 actually came in two different models. One model had an analog dial, while a different production run came with a digital dial. The digital readout version upped the price about \$100.

Although the Century 21 is no longer in production, the resale price for the radios are still quite high. Plan to spend about \$125–\$150 for the analog version and up to \$200 for the digital version.

Still believing in a market for small, medium-power transceivers (yes, there really is!), Ten-Tec introduced the Century 22. Like its bigger brother, the 22 sports a double direct-conversion receiver. The transmitter is again all solid-state but with only about 35 Watts of output. The case style is much smaller and looks very similar to the Argosy. The 30-meter band has also been added. The Century 22 only comes in a analog dial. As can be seen in the photograph, the inside of the Century 22 is wide open. This is a real treat for those in the service department. The top of the case holds the broadbanded transmitter power amplifier. The rest of the circuits are on the bottom half. The extra room on the top side is for the crystal calibrator and the keyer module, both of which are options. The Century 22 requires a external power supply which is capable of six Amperes.

Since the Century 22 is still being produced, check your local dealer for the best price. Flea market prices will show about \$250–\$300 for the radio.

What about taking all the features of the 505, 509, and the 515, throw in the 100-Watt amplifier, add crystal filters, and package the whole unit up into a modern case? Well, that is just what Ten-Tec did and what they came up with is called the Argosy. To me, this is a QRP operator's radio. The Argosy will run 100 Watts input, but, at the flip of a switch, power is reduced to 5 Watts. Gone are the direct-conversion receivers of the Century 21 and 22. With user-installed crystal filters, you can wiggle up close to the kW boys on 20 and not get blasted away. The small size makes portable operation a breeze.

The Argosy came out first with a analog dial. After many a re-

quest, Ten-Tec updated the unit to include a digital readout. In doing so, the receiver board was changed and the ALC now operates in the QRP position, something the original Argosy did not do. QSK operation continues in the Argosy, as does the superior audio, another Ten-Tec claim of fame. CW and SSB modes are available. The Argosy requires 9 Amps of current at 12 volts for operation. Install the noise blanker, plug the Argosy into the cigar lighter of the car, and go mobile. The Argosy is without a doubt going to replace the Argonaut as the mainstay in QRP operation.

While the Argosy does not cover all the WARC bands, it does include 30 meters. Ten meters has been spread out in four bands, so tuning around on ten looking for band openings will be much easier.

There are only several complaints against the Argosy. The #1 complaint is the lack of rf-gain control. The second is price. A new base-model Argosy is $695. Ten-Tec had dropped the Argosy from their line of transceivers, but brought it back by popular demand. The older Argosy with the analog dial can be purchased for about $350 on today's used gear market. The newer Argosy II, if found, can bring close to $450–$550, depending on filters and accessories.

From the PM series to the Argosy. There has never been a company more dedicated to the enjoyment of ham radio than Ten-Tec. Aside from the QRP transceivers, the Triton 1, 2, and 4 helped launch the industry into the age of solid-state power amplifiers. Soon to follow were the Omni series, Corsair, and the new Paragon. To all this and even more, add a warranty that makes the rest of the industry green with envy! No wonder Ten-Tec has earned the right to be called, "The Cadillac of QRP."

This completes my look at some of the companies that got in on the ground floor of QRP equipment. There are, of course, different companies that made and sold low-powered radios, among these Kenwood, ICOM, and Yaesu. Let us not forget also the many thousands of home-brew transmitters, receivers, and transceivers.

On the topic of home-brewing, the letters received in last month's column from the 6L6 special shows me you guys like to build. Well, before I forget, the schematic for the 6L6 Special was done for me by Stew Bracken KA8CZA. Stew did the drawing using Prodesign running on a Tandy 1200HD. A lot of people wrote and asked me about the CAD, so now everyone knows. Stew will be doing most of the schematics for me in this column.

Do you have a special project that you are building? If so, why not send it along with the schematics and other notes to be shared here in the QRP column? Write up your project and send it to me and I'll do my best to get it printed up here in the QRP column.

Whats coming up next? I haven't the foggiest! Summer weather is here and the bike is ready to roll. I'll clip on the HT and head out for the open road, bicycle mobile. So I guess you can say, until next month, "I'm gone with the Schwinn."■

73 INTERNATIONAL

NOTES FROM FN42

August is a red letter month, with seven National Days and eight Independence Days: National Holidays on the 1st for Switzerland, 2nd for El Salvador, 4th for Jamaica; Singapore has one on the 9th, the Congo and Korea both on the 15th, Morocco on the 20th, and Malaysia on the 31st. For Independence Day, Niger the 3rd, Bolivia, 6th; Ecuador, 10th; Chad, 11th; Pakistan, 14th; Indonesia, 17th; Afghanistan, 19th, and Uruguay, the 25th. It is Memorial Day in Cyprus on the 3rd and Freedom Day in Guyana on the 4th; the Queen has a birthday in Thailand on the 12th and it is Woman's Day in Tunisia on the 13th (which is on a Thursday). Four more days celebrating events of national pride are on the 20th, 24th, 27th and 29th, when it is, respectively, Constitution Day in Hungary, National Flag Day in Liberia, Liberation Day in Hong Kong, and Heroes Day in the Philippines.

ROUNDUP

Israel/Jordan. It will not be true for too much longer, one hopes, but for now, ham radio transmissions between these nations is forbidden. However, JY and 4X had a nice chat a couple of months ago.[*See Ron Gang's report from Israel, below: the kind of news which makes magazine sections like this one very satisfying to edit.—Ed.*]

Columbia. The Center of Emergency Communications—Centro de Comunicaciones de Emergencia (CCE)—of the Emergency Operations Committee of the Red Cross of Columbia at Ibague, Columbia, will be grateful to receive "any written material, maps, flow charts, photographs or catalogs that might serve as learning materials" for forums and seminars on emergency communications (emphasis on radiocommunications) in disaster and emergency situations.

The Center was created following the Nevada del Ruiz volcano which wiped out the town of Armero, in the Ibague district. The CCE will be a permanent function sponsored by all agencies, governmental and private, which have roles to play in emergency situations.

If you have anything you think would help, send it to Jesus Antonio Rivera Santos, Coordinador del C.C.E., PO Box 1298, Ibague, Columbia, South America.

Australia. A letter from Jim VK3YJ with his next column (which will have to wait for space in a future issue) speaks appreciatively of an editor's note in the March issue (at the end of the New Zealand column) reminding readers to (at least) send IRCs when requesting information from another ham. "I could just about write a book on the pitfalls of being a columnist to a worldwide publication" he says, and explains that one of the biggest is his frustration when faced with requests which involve expenses.

Both reasonable and some amazingly unreasonable requests for information and/or materials arrive with no contributions for postage or expenses, and much as he would like to respond, he simply can't afford to. *Please remember to pay your way! Don't, please, make our international contributors sorry they had their names and addresses published here!*

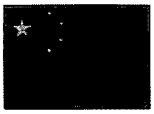
Nauru. This eight-square-mile, 8,000-population Republic in the West-Central Pacific Ocean may make a contribution to this column in a future issue. We have heard from Eddie DeYoung C21XX, Director of Telecommunications, who tells us the island has a dozen hams. Nauru has a fascinating history, one of the highest per-capita incomes in the world, and an uncertain future since the island is slowly disappearing.

Ireland. This being a packet-radio issue it is appropriate to quote from the May *I.R.T.S. Newsletter* (Radio Transmitters Society). It reports on the availability of public-domain software, DIGICOM 64, "an AX25 programme for the Commodore 64 micro." The Society seems to be doing a good job helping its members; it offers a translation from German of the instructions for the program and a copy (if a blank disk is provided) to anyone who has a C-64 with disk drive. And more: comments on the modem design suggested. It uses "a relatively expensive chip—the AMD 7910—but it is very simple in concept and the circuit includes an opto isolater to protect the C-64 from damage. Other than a few op.amps providing some filtering/buffering there is little else of note in the circuit and it is suitable for Vero-Board type construction." A remark many hams can identify with: "...users of the various homebrew TNCs are finding the learning process slow and a little painful."

Grand Cayman. Eden ZF1EJ and Jamie ZF1JC are the new president and QSL manager, respectively, for the Cayman Amateur Radio Society (PO Box 1029, Grand Cayman, B.W.I.) *** Pirates Week will be October 24–31, and ZF1ØPW has been issued for use by CARS members. It will be used on a multi-operator basis on all authorized bands and for all modes. The special QSL card is available for any contact made—send US$1.00 with a QSL card before January 1, 1988. *** ZF1MM (VE5RA) and ZF9SV (VE7SV) have advised the Club that they do not want the 500 or so QSL cards being held for them following the visit. There will be many disappointed hams. *** The use of 160 meters continues to be permitted *on a restricted basis only*. Visiting hams, and contesters particularly, take note. Permissable frequencies are 1.800–1.825, 1.875–1.925, and 1.975–2.000 MHz.

Finland. Last month, we reported the toll-free number (1-800-221-9539) available in the US (except Connecticut) to call Radio Finland. It has been so popular that another, NOT toll-free number has been opened: 1-203-688-5540. (*Radio Sweden International*, Bulletin 1934)

China. Sil Marini WPE4IIO, who has a BY1PK QSL card, writes: "For those not yet fortunate to know...BY8AC (Yang) has the most beautiful QSL thus far—Fantastic color photograph of 'The Bathing Caves', *gold leaf* CSRA symbol, BY8AC, Chinese characters....Gosh! Mine came today!"

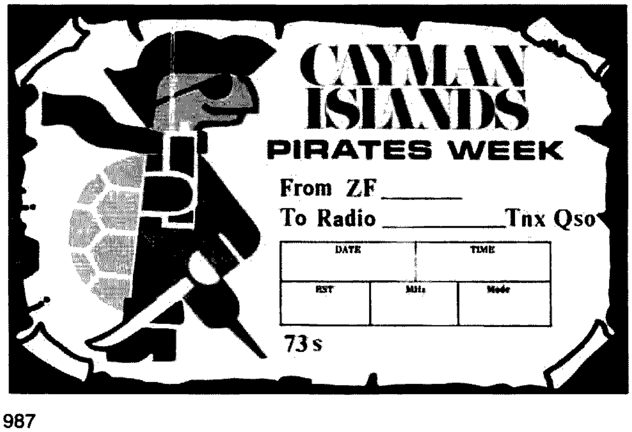


PEOPLE'S REPUBLIC OF CHINA

Chang Han Dong (BY4AOM)
Institute of Estuarine & Coastal Research
East China Normal University
Shanghai 200062
China

Amateur Radio on the Roof of the World—BTØNMN on Mount Namunani. At four past twelve o'clock, May 26, 1985, the China-Japan Mount Namunani (Mt. NMN) United Mountaineering Expedition's eight members reached their goal in one fell swoop. The Chinese news agency, Hsinhua, and Japan's newspaper, *Mainichi*, released the news in Peking and Tokyo, respectively, at fifteen o'clock the same day. The Minister in charge of the state physical culture, Honorary Vice Chief of the mountaineering expedition, Li MenHua, came to the amateur station BY1PK personally and listened to the report from Shi ZanChun, Chief of the mountaineering party, from BTØNMN. BY1PK and the Minister sent congratulations.

Mt. NMN is situated in the western part of the Himalayas in Tibet, with an elevation of 7,694 meters; it was a virgin mountain. The advance party and BTØNMN had set



out on April 13 and had an eight-day march, over the KunLun Mountains and through the valley between the GangDis and the Himalays. They then set up the base camp on a gentle slope northwest of NMN, at an elevation of 4700 meters.

The communications equipment consisted of a transceiver running 100 Watts, a power supply for special use, an AC-102 antenna coupler, and a 3-element yagi which could be raised to 9.5 meters on a metalline mast. The latter were bolt construction for easy assembly.

The station was to have been set up on April 23, but that day it was blowing harder and harder. The yagi was light but large in size (the driven element is over 8 meters, the tower mast 6 meters), so they had to put the antenna into the tent and wait for the next day. This dawned bitterly cold; the temperature hovered around 10 degrees below zero centigrade, but the team braved it and carefully assembled the antenna. What a magnificent antenna! It was standing like a giant in the Himalays—the first modern mark was made in the world of untrodden snow and ice!

In the tent there was a small desk and the transceiver was on it. Antenna direction: northeastern; frequency: 14.333 MHz; S-meter: good; swr: 1.5 below; power meter: 100 Watts. OK! Calling CQ. No answer. Oh... had passed the appointed time and had to wait until the next scheduled time. At ten to three in the afternoon, the operator worked in CW.

CQ, CQ, CQ.
BTØNMN calling. Standing by.
BTØNMN this is BYØAA returning. Your signal is 599, very good. Please go to SSB. BYØAA in XingJiang.

At this time BY1PK came on the air, and all the members were very happy. The advance party leader of the China Mountaineering Expedition, Shang ZiPing reported to Peking on the campsite setup. From then on there were a large number of climbing reports sent to Peking and an uninterrupted flow of instructions from Peking to the base camp.

May 26 was the climbing day for the peak. UHF rigs were worked beginning at 6 a.m. The base camp tent became the command post, with commands sent to the "shock brigades" of each campsite. Many reports involved weather, the progress of the climb, the drain on members' strength and on supplies. Reports went to Peking by HF. At a quarter to twelve the climbers reported to the base camp: "We have reached the peak. The top is very narrow, only holding two people, and there is much wind now."

Mountain party chief Shi ZanChun replied and ordered: "You must make the best use of your time and then withdraw at once."

So it was that at four past twelve the last two members of the party, who had been videotaping, reached the peak. And at 13:00 word reached Peking that the China-Japan 8-member team had reached the top of Mt. NMN for the first time.

During the expedition BTØNMN worked many foreign stations on 20 and 15 meters—about one thousand, with 30% of then being Japanese. Other nations included West Germany, France, Russia, Italy, Holland, Belgium, and Finland. The pileups were very very big at times, so it was very difficult, and hams who worked BTØNMN will prize their QSL cards.

BTØNMN glitters like a bright pearl in the history of Chinese amateur radio.

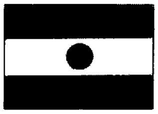
(Chang Han Dong writes, "I have received many letters from the U.S.A. from those who read my report and my letter. They are very friendly, so many thanks!"—Ed.)

ANDAMAN AND NICOBAR ISLANDS TEAMS

Team One—2/16–3/2. Andaman: Misses Bharathi VU2RBI and M. Bhanumathi VU2BL, Mrs. Rama VU2MYL, Messrs. Suri VU2MY, Nagarajan VU2KNN, and Saheb VU2SUS. **Nicobar:** Mr. Saheb, Miss Bhanumathi.

Team Two—3/3–3/18. Andaman: Miss Bharathi, Messrs. Jose Jacob VU2JOS, Subrahmanium VU2VSN, P.M. Subrahmaniam VU2SU, Upadhyaya VU2NUD. **Nicobar:** Messrs. Saheb, P.M. Subrahamaniam, Upadhyaya.

Team Three—3/15–3/27. Andaman: Miss Bharathi, Messrs. Ram VU2BQZ, Venkat VU2RAT, Kanth VU2LKP, Singh VU2DS, Suri VU2MY. **Nicobar:** Messrs. Singh, P.M. Subrahamaniam, Saheb, Suri.



INDIA

Mr. S. Suri VU2MY, Director
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India

DXPEDITION TO THE ANDAMANS & NICOBARS

This material barely survived the mails and it is likely that not all of it reached us. Parts were too damaged to read and a few editorial guesses have been made.—Ed.

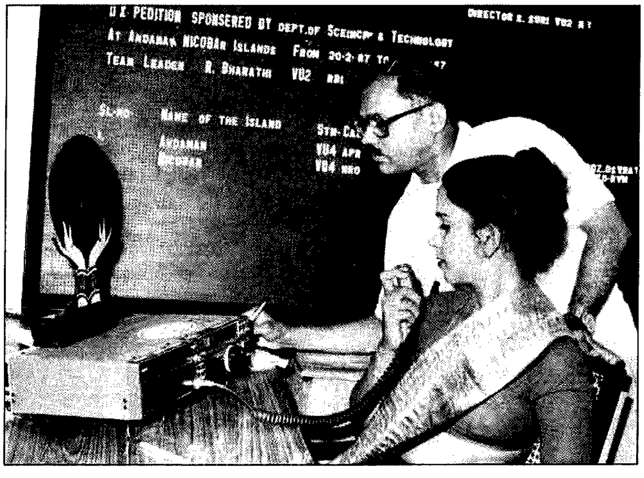
The ham members of the National Institute of Amateur Radio have very successfully conducted a DXpedition to the Andaman and Nicobar Islands and returned to the mainland on 1st April 1987. (See box.) Stations were set up in Port Blair [South Andaman Island] and on Car Nicobar w.e.f. 20th February to 31st March. The Car Nicobar station was operated exclusively on Morse code, CW. The achievements were:

- Over 30,000 contacts in 191 countries.
- Records established by the team leader, Miss R. Bharathi VU2RBI (14,450 contacts in 182 countries) and the trio of Messrs. Subrahmaniam VU2SU [or VU2VSN?] Saheb VU2SUS and Jose Jacob VU2JOS (8,000 contacts in Morse).
- Three expedition operators will get the DXCC award as a result of the 40 days of operation; it is estimated that 2,000 hams reached the DXCC level with these VU7 contacts.
- Preliminary counts indicate that the Japanese made the most contacts (10,000), followed by the USA (4,000) and USSR (3,000).
- There was an air-mobile contact (OK3WN) and several maritime-mobile contacts.
- Prime Minister Shri Rajiv Gandhi VU2RG wrote appreciation.

Lt. Gov. Lt. Gen. Oberai (Ret.) from Port Blair and Deputy Commissioner of the Nicobars Mr. Selvaraj IAS both opened the DXpedition programme and gave a farewell party. During the operation there were demonstrations and exhibitions, including one for the Nicobari Tribal students, a part of which was a programme for introducing them to the field of ham radio. Both the Lt. Governor and Deputy Commissioner feel that the development of ham radio would lead to a valuable supplementary communications resource for the islands.

DXpedition volunteers included three women, five students, a scientist, a disabled person and an aged (over 60) person. Hams from the US, Japan, and West Germany visited during operations.

There were operations on 160, 80, 40, 20, 15, and 10 metres, with only four contacts made on 160. Out of the 30,450 contacts, only one ham, Mike LZ2DF from Bulgaria was able to establish contacts on all bands; he did so with VU2RBI.



Activity on the Andaman/Nicobar DXpedition. (No identifications with the photo, but the only two names readable on the board are those of Director S. Suri VU2MY and Team Leader Miss R. Bharathi VU2RBI.) Note the graceful hands holding up the N.I.A.R logo.

N.I.A.R. AND THE FUTURE

Activities are planned in the areas of relief communications, medical traffic, nets, daily weather reporting, and the covering of and participation in sports events (car rallies, for example). Also: fox hunting, involving children with simple receivers and simple instructions, compass, area maps, etc., in what will be organized as a physical running sport in the forest, adventure, and radio-skills learning, adding up to a constructive nation-building activity.

These activities will need a lot of support from the government and philanthropic organizations. We want to enter into a new century by taking and opening opportunities as much as possible; we must keep up with the world, and do so through our own efforts.

N.I.A.R also has plans to organize a major international ham conference in Hyderabad in February next year, and wants to participate in the 4th world amateur radio direction-finding championship in Czechoslovakia in September, by entering 20 participants from all over India. This can be possible if the governments of India and the state of Andhra Pradeshsh and others come forward to provide the support which will be necessary.

On the top of the water tower at 940 meters. Lorens 5B4SA (R) is checking out the repeaters he can access with his hand-held. Amir 4X6TT on the left.

Operating positions at 4X9B (Bethlehem). Note electric heaters; it was cold there! L to R, 4X6TT, 5B4SA, and 4X6DX.

ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev M. P. O. 85530
Israel

EASTER IN THE HOLYLAND

Last year I reported on the Holon-Bat Yam Radio Club's week-long operation from the old City of Jerusalem, using 4X5J. [See *73* International, October, 1986.] This year they really outdid themselves, operating during the week of April 14–21 with stations operating *simultaneously* from five different locations of Biblical significance.

From Bethlehem, with antennas on a high water tower 916 meters above sea level, 4X9B tallied 15,000 QSOs. Operating three separate transceivers on different bands, the hardy crew contacted more than 150 countries.

Jerusalem was not neglected, with 4X2J operating from the same location in King David's Citadel that last year housed 4X5J. They made about 10,000 QSOs.

The peak of Mt. Tabor was crowned by a triband yagi and a station housed in a tent running off battery power. Here, 4X7T made close to 5,000 contacts under field-day-type conditions. Help from the nearby kibbutzim (collective farming villages) came in the form of food, accomodations, and the charging of the lead-acid batteries used. The kibbitzim Bet Keshet and Giv'at Oz, homes of the club stations 4Z4SL and 4Z4SQ.

4X3N, making 6,000 QSOs, put Nazareth on the map. 4X8S, at Stelle Maris on Mt. Carmel, was especially hot on CW, and completed the list of the five stations with never-before-used prefixes. Many of the operators were visitors from abroad who took up the invitation to take part in the operation as they were invited to do by way of the international amateur radio press. [See *73* International for November, 1986.]

One of the highlights of the operation made front-page news in the national papers. King Hussein JY1 of our neighboring country, Jordan, was in England at the time and was visiting an English amateur. Two of the above stations had their operators nearly fall off their chairs when Hussein called them. The King not only made the QSOs with them (59 both ways, of course!) but also wished the operators a happy Passover Holiday.

For those of you who may not know, at this date, at least, a peace treaty still remains to be signed between our countries, and radio contact is not permitted. Since King Hussein was operating an English station, no "laws" were broken, of course.

You no doubt remember that many years ago the thaw in U.S./China relations began with the famous ping-pong diplomacy, wherein American and Chinese sportspeople met face to face in a table-tennis tournament. Could it be that ham radio will help ease the tensions in the Middle East? The people in this area are weary of hostilities, and it is our hope that very soon a New Age will dawn—not only here but on the entire face of our planet. As hams, we can play an important part, and we must always remember that we can be ambassadors of good will from our respective countries.

To sum up, Easter in the Holyland, 1987, was an overwhelming success. QSL cards for all contacts have already been sent out through the bureaus, and a special certificate is available to those who made contact with four of the five special stations. If this applies to you, send details of the contacts verified by two licensed hams along with six IRCs or equivalent to: Easter 87 Award, c/o POB 4099, Tel-Aviv 61040, Israel.

OTHER NEWS

• A new repeater has joined the Israel Amateur Radio Club network. On 145.600 MHz with input 600 kHz down, it is situated high in the Samarian Hills, giving good coverage of the coastal strip from Ashkelon in the south to Haifa up north. A 192.8-Hz tone is necessary to access it. The machine is helping to relieve the congestion from the Tel-Aviv repeater. Visitors are warmly welcomed to bring it up.

• I'm sorry to report that after almost 40 years of free licenses to visiting overseas amateurs, the Ministry of Communications is now charging our guests $10 for their reciprocal license. Otherwise the procedure remains the same as I have outlined in previous columns.

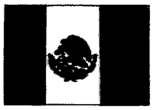
• A new callsign prefix has come into use: 4X1. This is to designate the Class A license, but present holders of the A ticket will not be forced to change their call. They may use any suffix available with a 4X1 prefix on a first-come-first-serve basis, and may continue to use their old call as long as QSLs for same remain in their possession.

Class B holders remain 4X4, 4X6, and 4Z4, while Class Cs (Novices) are 4Z9. The 4X8 prefix will be granted hams visiting from abroad who have rendered spe-

cial services to the Israel Amateur Radio Club.

• Amir 4X6TT announces that he is starting an around-the-world jaunt for a year and intends to operate from as many countries as possible. He asks that you look out for him on the air—and don't be surprised if this young man shows up on your doorstep!

MEXICO



Mark Toutjian XE1MKT
Apartado Postal 42-048
06470 - Mexico, D.F.

SPANISH ANYONE?

If communication were nothing more than just learning a language, things would be much easier; all of us hams could unearth high school foreign language texts, turn our transceivers on, and begin chattering phrases in any language.

But it doesn't work that way. Look at the numbers of people who go to a foreign country—such as Mexico—right out of a formal Spanish course and find themselves faced with that frustrating stare that says so eloquently, *"What on earth are you trying to tell me?"*

But at least they make the effort. I've had a few QSOs with non-Spanish-speaking colleagues who froze up at the idea of repeating a few words in Spanish. I couldn't even get them to say *"hasta la vista"* or even a little *"adios"*!

Yet, I understand how they must feel. Although I "learned" Spanish in school back home (in the San Francisco Bay Area), it wasn't until I married Ruthy—a beautiful *senorita* from Mexico—ten years ago and moved to Mexico that I became fluent in the language. And, yes, over the years I have stuck my foot into my mouth more than once. But I am consoled by the thought that if people learn from their own mistakes, many are getting a fantastic education!

Fear of looking (or sounding) stupid chokes up many people. I had to learn to laugh at my mistakes—along with those who witnessed them. Yes, mastering a new language is educational in more than one sense.

But, as a ham radio operator, think of it this way: You don't have to move to a foreign country to learn *and become fluent in* the language of the land, whether it be Spanish or any other tongue. Whether you took a foreign language in school or you are just beginning to study it, your ham gear puts you in that foreign country and gives you the opportunity to *really* learn it.

Or even better: When you learn a new language (even just the basics), you open a door to millions with whom you probably never would have been able to communicate in your entire lifetime because of the language barrier. And who knows . . . there may be many lasting friendships out there waiting for you.

On the other hand, I know for a fact that most Spanish-speaking ham radio operators want to learn or improve their English. You could help them at the same time. So why not learn Spanish? Take fuller advantage of your equipment. And remember that no language is TOO hard to learn. If a baby can do it, so can you—*hasta pronto!*

[Ed. note: A Danish lass and I became first-name acquainted on the old Gripsholm *many years ago. Her name was Svea, or Svia, rhyming with Tina, so that's how I decided to remember it. Next day I saw her across the lounge and hailed her: "Hello Svina!" Well, that's phonetic spelling for svine, as in swine . . . but she forgave me with an amused smile. I forgave myself, but only after hours of agony. XE1MKT is absolutely correct—and most of the time the mistakes are really amusing. In Puerto Rico in 1940, I thought it funny that every movie theatre in San Juan was running the same show, "Hoy." In Germany I got lost because so many streets had the same name:* "Einbahnstrasse."*]* ■

DEALER DIRECTORY

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Your company name and message can contain up to 25 words for as little as $199 yearly (prepaid), or $50 for three months (prepaid). No mention of mail-order business permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the December '87 issue must be in our hands by October 1st. Mail to *73 Amateur Radio*, WGE Center, Peterborough, NH 03458. ATTN: Hope Currier.

PROPAGATION

Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U.S.S.R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

August is expected to be a good month for propagation on all bands between 80 meters and 1296 MHz! HF bands will show good conditions for first three weeks. An active magnetic field and a magnetic field with an aurora are possible the last week of the month. Erratic and unusual conditions are likely between the 20th and 26th of the month; propagation could range from exceptional to impossible!

AUGUST

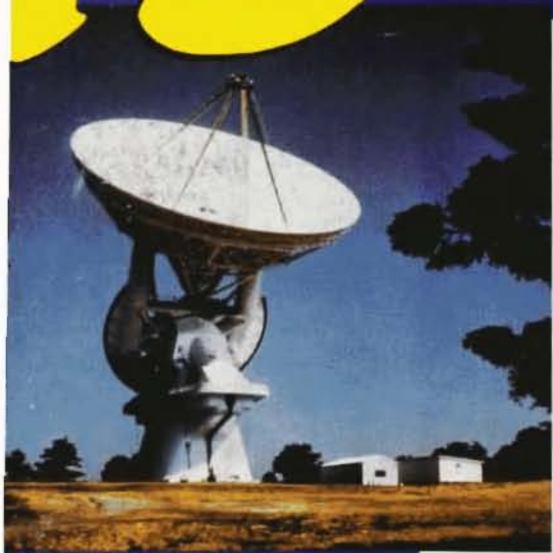
SUN	MON	TUE	WED	THU	FRI	SAT
						1 G
2 G	3 F	4 G–F	5 G–F	6 G–F	7 G	8 G
9 G	10 G	11 G	12 G	13 G	14 G–F	15 F
16 F	17 F–G	18 F–G	19 G	20 G–F	21 F–P	22 P
23 P	24 P	25 P	26 P–F	27 F	28 F–G	29 G
30 G	31 G					

73 Amateur Radio

SEPTEMBER 1987
Issue #324

USA $2.95
CAN. $3.95
A WGE Publication

SPECIAL ANTENNA ISSUE



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NEVER SAY DIE

FLAB BUSTERS

If you've been doing your homework properly you're well aware that science is quite definite about two things. No matter what the Tobacco Institute does to muddy the waters, the fact is that smoking has two major drawbacks—one, it shortens your life substantially, adding even more to your misery by making your final years far more painful than for non-smokers—two, you're setting an awful example for your kids.

The other science fact is that the more overweight you are, the shorter your life is going to be, other things being equal.

Now, it may be that you, like a few million others in America, are living a life of quiet desperation—anxious to have it all over with, but without the guts to take a long walk on a short pier. We might call that pier pressure. It's unlikely though, for most unhappiness stems from isolation—being lonely. As a ham you have only to turn on your rig and you're immediately up to here in potential friends—unless of course you're a DXer.

DXers have no friends. Their milieu is the pileup or the list, neither of which is calculated to encourage any good feelings from either their competitors or the DX ops having to listen to the silly mess. When a DXer makes a contact, all the other DXers are angry and begrudge every second it keeps them from getting through. Tail-ending, breaking-in, swishing around the band calling, all tend to cause aggravation, not happiness. The DX op, knowing you could care less about him personally—that all you want is a lousy QSL card—isn't one of your bosom buddies either. So much for DXing—and I've worked 320 or so countries and operated from 56 so far, so tell me about it.

There isn't much I can say about smoking—as nasty a government-sanctioned drug addiction as there is, one which inevitably leads to death—usually a painful, lingering one. So light up and let's discuss that big fat beer belly of yours. I see your eyes shifting nervously—I'm hitting home for a lot of hams. Sure, I've seen you at Dayton, your lard hanging over your belt.

You know what scientists have discovered? Well, you don't want to know. They began to suspicion it over fifty years ago when they found that mice fed just above a starvation diet lived twice as long as well-fed mice. Ooops! They've been hoping this didn't apply to humans because scientists, like the rest of us, are addicted to eating.

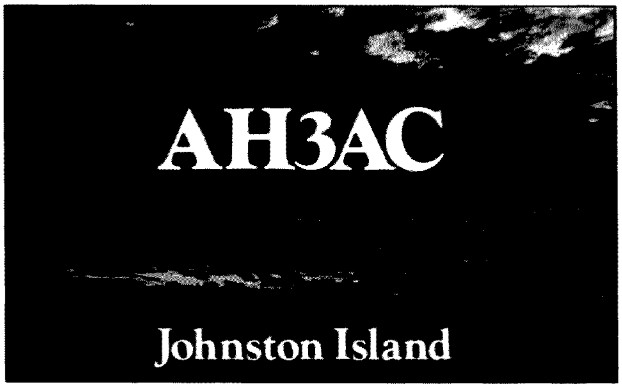
If you've got a good reason to try and stay alive longer than average—and even have hopes of doing this while staying healthy, which does tend to make it more fun—if you're interested in being one of the last surviving hams and writing a book on how we lost our ham bands, one by one, to commercial interests, then you're going to stop smoking—or even breathing second-hand smoke—and you're going to diet down until you are thin. I'm not talking average weight, I'm talking t-h-i-n.

About fifteen years ago I got tired of being fat. I'd been fat since around ten years old when my grandmother filled me full of her incredibly delicious pies, cobblers, and cakes and could find no real benefits to the condition. So I went on a 1500-calorie diet for eight months and dropped 85 pounds. Oh, I eventually put about ten back on, but in general I've held my weight ever since.

Eight months without ice cream—without cake...aaargh! Eight months of cutting the fat off my meat (don't you love ham fat?)—eschewing (not chewing) bread and butter. The fanatic dieter steps anxiously on the scale each morning, hoping for the best. It gets to where you brush your teeth, blow your nose and spit a couple of times, just to be as light as possible for the weigh-in. Good, another third of a pound gone! Whew.

I'm 65 this year so when I read

Continued on page 10



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

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QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

Education and Young Hams

AMATEUR RADIO HAS OFTEN BEEN ACCUSED of being a pastime for the aging; not totally untrue in light of a recent poll which put the average ham at 58! QRX this month focusses on what's happening to bring fresh blood into our hobby. But first . . .

Larry finds Greener Pastures

WE AT *73 MAGAZINE* ANNOUNCE LARRY LEDLOW NA5E/G0CQW/9H3FS as our new Editor-in-Chief, starting in September.

Larry is bringing a great deal of pertinent experience to the post. He has been writing technical reports for, and editing, official Department of Defense publications since 1980, and has been a regular contributing editor for several journals, including *Monitoring Times*. He is also founder of the only active volunteer examining team in United Kingdom (1985), and has taught numerous U.S. licensing courses since 1983. He has also been extremely active in organizing special event stations and DXpeditions (NA5C/C56 in 1985, and 9H3FS in 1986).

We are proud that Larry chose to be with us to pursue two fine talents of his: writing and amateur radio!

Inter-Urchin Packet Mail

A PROJECT FOR PUTTING DEMONSTRATION HAM RADIO STATIONS IN ELEMENTARY SCHOOLS has provided inspiration for a pocket pen-pal message exchange in New England.

Byron "Luck" Hurder KY1T recently installed a small amateur radio station in his local elementary school on Cape Cod, and reported this in a message to "ALL." When Conrad "Butch" Ekstrom WB1GXM, an elementary school teacher in Lempster NH and an ardent ham, suggested exchanging messages between the students of the two schools, Luck and Butch prepared lists of names, ages, and sexes of their respective candidates and matched them up.

There have now been several packet message exchanges between the two schools. Other hams have already asked to participate, involving several schools around them. This is certainly a nice, easy "grass-roots" project and an excellent promotion of the hobby to young people!

Ham Scholarships

THE PRESIDENT OF THE DAYTON AMATEUR RADIO ASSOCIATION, Ray Smith KR8B, has announced the winners of the association's 1987 scholarships. They are: Douglas Kleeman KA9LWM of Shawano Wisconsin; Carol Colby KA8PLF of Midland, Michigan; Robert Jackson KA7OCV of Tucson, Arizona, and Michael Woznlak KD8TA of Martin's Ferry, Ohio. Each of these students will receive one thousand dollars toward tuition at the school of their choice.

The program is open to any FCC-licensed amateur graduating from high school in the year that the awards are given. There are no restrictions on the license class nor course of study selected by the student.

Information and applications for the program are available after January 1 from DARA Scholarships, 317 Ernst Avenue, Dayton OH 45405. The deadline for receipt of the completed applications is May 15.

Robert Jackson KA7OCV

WB2JSM On Air Again

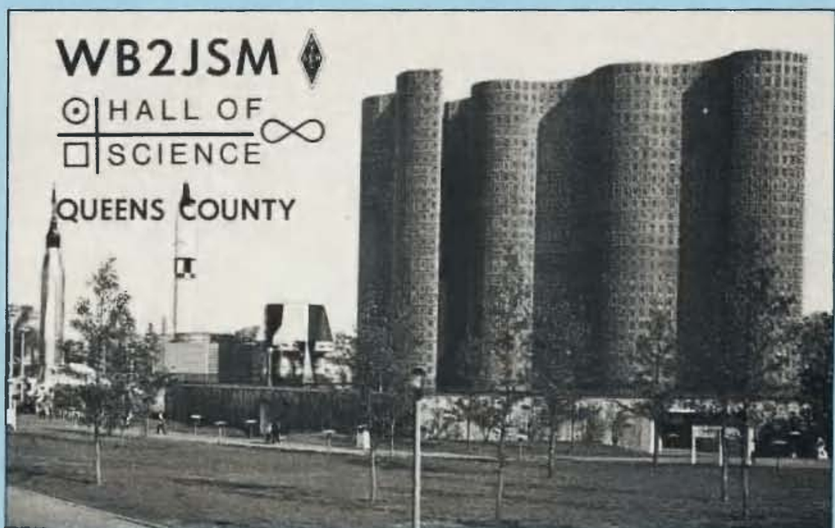
AFTER A NEARLY SEVEN-YEAR HIATUS, the Amateur Radio Club Station of the New York Hall of Science at Flushing Meadows-Corona Park is back on the air. The station had been closed since 1981, when the Hall was closed for major renovations; but now has been instituted as a permanent exhibit which will be operated on the weekend, during normal visiting hours.

This 100-member club has been cited for its many outstanding endeavors, such as traffic-handling for the New York relatives of people affected by the earthquake in Guatemala in 1979, and in Italy in 1980. The Club also visits the pediatrics section of the Flushing Hospital at Christmas to enable the children there to have a direct link to Santa Claus.

The President of the Club, Arnie Schiffman, says that there will also be special amateur radio sessions set up for school children at the Hall.

Enhancement Stats

NOVICE ENHANCEMENT WAS CREATED TO ALLOW BEGINNERS VOICE PRIVILEGES in sections of the 28-, 220-, and 1270-MHz bands, all in an effort to arouse new



interest in amateur radio, *and it is working.* The number of ticket applications in April broke the 3,000 mark, the first time in several years; and in May, the FCC received a whopping 7,065 applications! The number of 6-10 forms processed by the FCC for these two months has nearly doubled over the same two months in 1986.

Task Force Update

THE RESPONSE to the recent call in *QST* for volunteers for the ARRL Education Task Force was very good. It is now possible to organize and distribute the work of the group through the creation of separate "working groups" to address the elementary school, high school, and adult education levels. 22 hams are on the task force altogether, with five in each of the working groups.

There are two main purposes for the Educational Task Force. It will review and update curricula for the teaching of all classes of Amateur Radio, using techniques currently available in the education discipline; and explore and report innovative methods of establishing Amateur Radio clubs in elementary, junior, and senior high schools.

For more information on this, contact Tom Frenaye K1KI, ARRL New England Division Director.

Beverly Hills Hams

TWO YEARS AGO, Craig Dible KB6LAK, a social studies teacher at the Horace Mann Elementary School in Beverly Hills, brought a shortwave radio to his class. Antennas were put on the roof, and the class became known as the school's listening post. They tuned into broadcasts from all over the world, and discussed in class such issues as Japanese reaction to President Reagan's proposal to impose tariffs on their products, and how the Soviets, British, and Americans treated the Chernobyl disaster. They also monitored local police, fire, and emergency medical frequencies.

Now, after listening to many broadcasts, students wanted to become part of the action. With $3000 in state grant funds, Dible set up a ham station at the school. Six of his students have already gotten their tickets, and three more plan to take the test soon. In all, about forty of his students are using the equipment.

Paul Mazer Honor Award

IN MEMORY OF SILENT KEY, PAUL MAZER N2PM, the Board of Directors of the New York Hall of Science ARC have established the honor award in his name. This year, at a New York Hall of Science ceremony, Paul's wife Dorothy Mazer presented this special award to Joe Fairclough WB2JKJ.

Joe developed an English curriculum around Amateur Radio. Students learn the International Morse code at the start of the term and practice their spelling and vocabulary skills by using CW. Grammar is taught using Amateur Radio publications and books as texts. Through Joe Fairclough's instruction and patience, many of his students have qualified to become licensed amateur radio operators.

73 Magazine extends congratulations to Joe WB2JKJ and his Kids for a job well done.

WNZ Award

THE EDITORS OF *CQ MAGAZINE* announce the Worked Novice Zones (WNZ) Award, which is available *only* to holders of a U.S. Novice or Technician class license for proof of contact with at least 25 of the 40 CQ Zones as defined by the WAZ rules. All contacts must be made using the Novice 80-, 40-, 15-, or 10-meter bands, using modes authorized for these bands, and using transmitter power authorized for the Novice or Technician license. All contacts must be made as a Novice or Technician, although at the time of submission, the licensee may have upgraded to a higher class of license.

The WNZ award is available as a mixed mode, CW only, or SSB only. Rules for the WNZ are essentially identical to the standard CQ WAZ rules. The WNZ award may be used to fulfill part of the application requirement for the WAZ award when the operator is finally able to confirm the remaining 15 Zones.

This award is a good first step for Novices and Technicians toward the "big-league" awards. For application and zone map, write to *CQ Magazine* in Hicksville NY 11801.

W9PRN Scholarship

THE EDMOND METZGER W9PRN SCHOLARSHIP has been created for students who attend the University of Illinois, Indiana University, or the University of Wisconsin. They must be pursuing a course of study in Electrical Engineering, be a licensed radio amateur, and be a member of the ARRL. For further info on this scholarship, please contact Don Evilsizor KA9QWC, R.R. #1 Box 206, Larwill IN 46764-9726.

Articles!

GRANTED, THE DAYS OF THE TOTAL HOME-BREW STATION may be fading fast. Granted, the awesome circuitry of today's full-featured rigs daunts all but the most technically minded of us. But natural curiosity and the skyrocketing prices of equipment still keep hams constantly tinkering and coming up with a better—and cheaper—mousetrap. And, of course, the increasing sophistication of our hobby demands more than ever the talents of those who can explain complex material in simpler terms.

So, if you're sitting there saying to yourself "This project was so cheap/fast/simple/neat that I'll have to write about it some day," make that someday *today*. Call or write us about our editorial calendar. All submitted articles will be promptly reviewed.

Let hams the world over in on your great ideas—through *73 Magazine*.

Thanks to . . .

THIS MONTH'S QRX was compiled with the help of *Hamsplatter*, *The W5YI Report*, *The ARRL Letter*, the New York Hall of Science, David McLanahan, DARA, *The Los Angeles Times*, *CQ Magazine*, and the good pup Lena. Send your news and photos to *73 Magazine*, WGE Center, Peterborough NH 03458-1194, Attn: QRX.

Wayne with one of the junior members of hamdom, Jake KB5BNR, at the Dallas Hamfest. Jake was eight *when he got his ticket.*

NEVER SAY DIE

from page 4

the obits of much younger people buying the farm, I get uneasy. A great many of the hams I knew when I started out are long gone. I'm running out of pens to mark old friends in the Silent Keys column. Ken Grayson W2HDM, Carmine Miranda W2MLM, Garald Silsby W1MCS, John Williams W2BFD, Dexter Miller W2MSZ, Bob Gunderson W2JIO, Oscar W2KU, Sam Harris W1FZJ.

Perhaps it's the same sense of invulnerability which lets kids drink and drive which blinds us to the consequences of swilling six-packs and chomping potato chips—or even wolfing down a Whopper, which has around 650 calories! I found that a few months of single-mindedly dieting worked wonders. As they say of cocaine, ice cream is wonderful, but is it worth dying for?

The hardest part of dieting is making the decision to actually do it. Once you've done that the rest is easy—and incredibly rewarding. Once you don't have to make a decision about ice cream and other crap like that, it's a piece of...er...salad. Oh, your body will fight back for a few days, but once you're adjusted to 1500 calories, you're never hungry and the fat just slowly burns off.

Did you catch Richard Pryor's monologue about his addiction to cocaine? Well, what he went through is a lot like your and my addiction to fattening foods. We're surrounded by temptation—the cold cereal shelf at the supermarket—the ice cream section—pies—a whole aisle of bread—a bakery boutique—the crunchies section—beer by the case—Lordy! The meat case is full of steaks marbled with fat—chicken with that deliciously fat skin—sausage—luncheon meats (packed with fat)—you have to go some to find real food.

I'm going to be watching at Dayton next year to see how weak-willed you are.

Speaking of losing our bands, which I did, how soon should we start a pool on which ham band will be the last we lose? I'll put my money on 2m, just because it's the one we're using the most.

As our ranks thin, we're going to have less and less say in what happens to our bands. A group of doddering old men who are contributing virtually nothing to the world aren't going to have much influence against well-heeled Washington communications lobbies. We're still holding on to our bands by virtue of things we did a generation or two ago, not as a result of what we're doing today.

I'd love to publish articles on spead-spectrum communications—on digitally-encoding phonetics for ultra-narrow band voice communications—on high speed packet systems–but if no one is left to experiment and write the articles, I'm sitting here with an empty in-basket. Yes, I realize that if I did get such articles that most hams wouldn't want to read about such new-fangled garbage, humph. But I'm game to try.

You wouldn't believe the Wayne Green hating which went on back in 1970 when I started publishing endless articles on FM and repeaters. Lordy, the massive reaction I got to that. But I stuck to it, pouring out articles in *73*, publishing a monthly Repeater Bulletin, organizing FM symposiums around the country. After a couple of years everyone had a 2m mobile rig and a couple of HTs.

This isn't a health magazine, so I'm not going to run hundreds of articles on getting into shape—generating another generation of Wayne Green haters. But, fellas, I talk with you on the air—I see you at hamfests—and I know many of you enjoy reading my editorials—so I feel like you're personal friends and I worry about you. I want you to be healthy—to make plenty of money and to enjoy amateur radio with me.

If we're going to have any chance of holding our bands we have to pay our dues. We've been having a free lunch for a generation now—ever since the incentive licensing disaster in 1963. Your dues these days are less using our bands (use it or lose it) than in getting youngsters involved—youngsters who will be straining at the bits (and bytes) to try new communications modes—youngsters who will pack *73* with articles on developments—articles which will build a whole new generation of small businesses like AEA, Kantronics, GLB, and so on.

In the modern communications world amateurs are still stuck with smoke-signal technology. We're pathetically ill-equipped to deal with any serious emergencies. The only bright side to all this is that, as backward as we are, we're all our country has to depend on in emergencies.

If your club is having some success in attracting youngsters and getting them licensed, please let me know about it so I can pass the word. In the meanwhile, what is your club doing to get some excitement going on 220? I'm not hearing crossband repeaters from 220 to 20m, which will allow me to talk with your local Novices. Let's see some action.

NOVICE ENHANCEMENT NEWS

How well is it working? Hmmm, if you want to keep from stepping on toes, perhaps you'd better not discuss this controversial subject over the air. Of course, the fact is we don't know yet.

> ***"...scientists....found that mice fed just above a starvation diet lived twice as long as well-fed mice."***

One thing we do know is that we have all our bets on it. I don't know of any back-up projects the ARRL, the industry, or even the FCC have in mind in case Enhancement doesn't bring in the expected flood of newcomers.

Bill Welsh W6DDB, who's been far and away the most prolific Novice licenser in ham history—he won the coveted Edison Award from GE a generation ago for his work—says he hasn't seen anything to be happy about so far. He compared the California licensing totals for the first four months of the last five years. These went 950—912—615—556—600.

Bill pointed out that the slight increase for 1987 reflected the rush by Novices to get licensed before the more difficult exam hit. Bill predicted a higher than normal April and May, then a real drop in June.

The decrease in lapsed Novices has artificially inflated the FCC's figures showing the total number of hams. This is attributable to the ten-year Novice term, not more upgrades.

Bill feels that the ARRL has sacrificed what was a simple Novice system in a vain effort to save 220-225 MHz. He belives that the ARRL has messed up again—strange words from someone who has been such a strong League supporter.

All we have to do is wait and see who's got the best crystal bail. I'm on record as being eager to be absolutely astounded if Novice Enhancement brings in a significantly greater number of Novices. I suspect Bill may be right—this may be just another case of foot-shooting. Not what we need at this time when our hobby is disintegrating before our eyes.

I'm put in mind of a man in his 50s who suddenly finds himself out of work. Panic sets in and he wastes his money and time on one foolish get-rich-quick scheme after another instead of buckling down to hard work. Desperation knocks out common sense. A man in his 50s out of work has a major problem in our society—forget it if he's 60...where the average ham age is headed.

Bill's figures sure jibe with those from W5YI showing a steady national drop in new licensees—about 10% per year. So, are we going to bet the farm on Novice Enhancement or are we going to work on some backup projects such as getting our ham clubs involved in developing Novices and radio clubs in neighborhood schools?

It's been a while since I sat down with the individual commissioners and updated them on amateur radio. We have some new ones who don't have a clear picture of our history—our past accomplishments—and how past FCC actions have almost killed an incredibly important national resource.

In the meanwhile I'll be listening for you around 14.2—my current need for penance is satisfied on 20m phone. If you indulge in similar self-abuse and have any ideas for helping amateur radio grow, but are too far along with Parkinson's to write, give me a call.

WHAT WILL EMP REALLY DO?

Despite major efforts to keep a lid on the nuclear electro-magnetic pulse (NEMP) situation, word is gradually leaking out. Looking it

Continued on page 55

LETTERS

HF BLUES

Recently, I was on 20 meters settling down to a homely QSO with a long-lost DL friend. A couple of *overs* later, two Whiskeys (one too many?) came up on frequency with "Bill, are you there?" . . . When I tell him that the frequency is in use, he comes back and says "Yes, it is." I later found out that they were having a QSO across town with guns blazing, with S-9 plus in southern India.

Even with 400 Watts, a four-element tribander, and the best QTH in town, staying alive on twenty phone is problematical, at best, for me. I finally got the notion to go to A1 mode, in the hopes of finding freer bandspace and more courteous users. But even after making sure that I'm clear by 2 kHz on either side and calling QRL twice before CQing, no sooner than getting a QSO going and working QSK, then I hear tune-up, V. .V. .V. .V, etc, between my transmissions. And when I sign off and end KN, all hell breaks loose! No one seems to know the meaning of KN, or have any patience for the QRZ. By my second QSO, the channel is inundated with QRM, mainly due to those who don't contact with me and set up shop next door to call CQ and drift all over. It's impossible to work there, even with a razor-sharp filter. The situation is like a fish market—it stinks!

Back on phone, the situation is even worse. By the time I'm in my second QSO, everyone wants to know if the frequency is in use (to see if I copy). Adding all the tune-ups, oolahs, and bird songs of all species, it's a total assault on my ears (it's a hobby, OM, remember).

QSL cards. About *20%* QSL. I've been sending my cards direct to individual burrows and call areas; I still need W5, W7, etc. cards. I'm still waiting. . . maybe TAD after 10 years.

I'd be interested in seeing a study of cardiac problems on ham radio ops. There well may be a direct relation between the number of operating hours and increasing risk of heart attack. Stamp collecting, gold-fish watching, and star-gazing may be our alternatives.

I don't really know why I take this punishment and keep coming back for more—is it addiction?

Rajendra Kumar G. G. VU2ZAP
Bangalore India

OVERSIGHT

An important piece of information was left out of the report on the Amtrak/Conrail train crash ("Death on the Rails" April 1987): the vital role amateur radio operators played in the emergency operations. For more than three days, approximately 190 hams were on the scene or standing by throughout the Baltimore area.

Hams were the only communicators who could talk from rescue command and all trackside locations. Hams supplied direct patches to the shock trauma center: one patch even connected trauma surgeons directly between rescue command and the operating room. A command center was set up at the Pikesville firehouse at 1:37 p.m. on Sunday, Jan. 4th—just four minutes after the accident took place. The irony is that a meeting had been scheduled for Baltimore County FD hams on the eighth. The meeting, held after the fact, was attended by fire department members and goverment officials, and established guidelines for amateur emergency communications.

Whoever wants more information on this subject may contact me at Pikesville Fire company, 40E Sudbrook Lane, Baltimore MD 21208.

Firefighter Terry Turchin
Baltimore MD

ILL-EAGLE

At the end of May, I attended the Consumer Electronics Show in Chicago for the first time. Anyone who has never been there is really missing out!

As I recall, I read in *73* of certain wholesalers and retailers who are marketing the "Eagle 1" HT UHF transceiver as the ultimate CB. The trouble is is that the radio is designed to operate in the 440–450 MHz part of the spectrum, right at the top of the amateur 70 cm band! Although the fine print says FCC license required, when I asked the salesman at Samhill Corp. about licensing, he said "No problem—since they're low power, you don't really need to bother." Samhill was marketing the *Eagle 1* at the CES, as well as high-power cordless phones with an 80-km range for export only.

As I got into it with the salesman, I realized that he knew all along that the radio operates in the Amateur portion of the spectrum. In disgust, I moved along to the next booth.

Perhaps you, or any of your readers can suggest what can be done to stop these unscrupulous dealers from marketing these and other such radios as glorified CBs.

And hey—you print a great magazine!

Dan Busse KA0TER
St. Louis MO

Thanks Dan! Readers running into this kind of mischief should send a report to me—I'll see that the FCC gets it—Wayne

FEWER LICENSE CLASSES

In recent years, the Commission has seen fit to eliminate the requirement for licensed personnel in almost all phases of commercial radio and television operation. This began in the early 1950s, when it eliminated the requirement for a First Class Radio Telephone Operator to be on hand whenever a broadcast transmitter was on the air. Today, the Commission has deregulated licensing requirements in almost all phases of radio, except the Amateur Radio Service.

In 1950, there were only two classes of amateur radio licenses, Class A and Class B, and a mail-order Class C with the same privileges as B. In those days, there was some justification for having license distinctions, since almost all transmitting equipment was home-made, and maintained by the operator. In addition, technical skill and CW ability was indeed a national asset in the form of trained personnel for the armed services who still used low-tech equipment and CW as a means of communication.

In 1987, we have five classes of Amateur licenses, in an age where very few transmitters below the microwave region are built by the licensee. Maintenance is almost universally performed by skilled technicians of the manufacturer or an authorized agency.

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Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0745-080X) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

The armed forces and commercial agencies have practically no use for trained CW operators. We have many thousands of highly portable transceivers that can give us emergency communications vastly superior to equipment in the old days, and not requiring a large amount of technical knowledge to operate effectively.

With the above in mind, the question *arises* as to the necessity of the expenditure of federal funds to maintain five classes of license, with all of the paperwork required with no apparent benefit to the public and very little benefit to the Amateur Service beyond the snob-appeal and "Merit-badge" precept of the Boy Scouts. I think that such recognition can be achieved through the Code Proficiency Certificate issued by the ARRL at no cost to the government.

Therefore, I suggest that the Commission go back to a two-level licensing system. The lower class would combine Novice and Technician classes with Technician operating privileges. I would add to this all amateur frequencies and modes above 28 MHz, with a power limit of 250 Watts from the transmitter.

The advanced license would combine the privileges of the General, Advanced, and Extra-Class. The theory exam would remain the same as currently required for the General Class, and the code requirement reduced to 10 wpm. As CW becomes more obsolete, there is less reason to make it a stumbling block in the Amateur Service. It would be like making knowledge of loop-modulation, spark-gap technology, or cats' whiskers part of the current testing.

Reducing the number of classes to two would also eliminate the requirements for the controversial call-sign system that has evolved over the years which has become a mode for status seeking. If there is a desirability that callsigns designate license class under the new system, I suggest issuing 2 x 3 calls, beginning with a "K" for the lower Class, and beginning with a "W" for the more advanced Class. Almost all KC–KZ x 3 and WE–WZ x 3 calls would be available. This would eliminate a lot of paperwork and computer time over the *present system*.

I hope the Commission will give the above requests serious consideration.

Sheffield P. Wilds W4GVD
Pineola NC

GOOD ENGLISH

I am writing because I feel that we, as hams, have a unique opportunity to do the world a real service. As you point out, Wayne, it is becoming more and more apparent that English is the chosen language for all ham contacts. It behooves us, who are native-born Americans, to speak our language concisely and correctly! I am appalled when I hear a contact between a DX and an American station, and hear the American butcher the language while the foreigner speaks grammatically correct (however accented) English. It makes me wince to hear a ham of ours refer to his "diapole antenna", or call the wires that secure his tower "guide wires", or talk about an unknown system of early digital communication called "Morris code". I can't begin to talk about our love for using double negatives, strange contractions, and incorrect tenses; such as "ain't got no", "cain't hear ya", "don't have none", "I have went", and "*He ain't went* home yet". How about "Best 73s everyone?" 73 is "best regards", which makes the above phrase redundant!

Perhaps we should mount a campaign to get *American* hams to speak English before we *expect* the same of our foreign counterparts.

Jim Oberto WA9YYV/7
Phoenix AZ

CODE LEARNER'S PERMIT

I am a physics teacher, and supervisor of our electronics/radio club of 4–8 members, three of which are hams. I have been reading your articles about how to interest young people in radio, and definitely agree that the code requirement is a deterrent. My students are able to learn the rules and regs and the basic theory in two or three meetings, but after a full day of classes, sports, and homework, only a few highly motivated ones find the time for regular code practice. Many of my club members start enthusiastically learning the code, but their interest slowly fades as daily demands inhibit code practice, and they don't have the stimulus of being "on the air."

My daughter recently obtained her learner's driving permit and during a week-long road trip we went on, during which she shared the driving, she made tremendous progress. It occured to me while I was trying to nap during her shift (no chance), that the learner's permit concept is ideal for potential hams under the age of eighteen. I suggest, then, allocating a portion of the Novice band with full operating privileges for learner's *permit* holders, with a ham's *supervision* and guidance. They should have already passed the theory and rules exam.

This "learning by doing" is a valid concept. If you don't believe it, just look at how many kids know about computers, which they learned about through hands-on experience.

Chuck Warren WB0PAV
Ojai CA

PRO CODE

I am a 24-year-old Staff Sergeant in the U.S. Air Force, and a microwave radio technician. I have also just recently passed my Novice exam.

My gripes concern "Never Say Die" in the April issue. I first want to talk about Wayne's comments about amateur radio and the military. Speaking from experience, the military prefers to train people in their own manner. No one without their training is put directly in the field anymore. Of course, hams tend to get through the technical training more quickly. And, as far as the code goes, the Air Force still teaches it for use in contingency (wartime) situations. Let's face it: under heavy interference, the code can get through where more sophisticated modes fail.

Secondly, have you heard the normal traffic on CB lately? CBers really don't have the respect, etiquette, and technical knowledge, of hams. Thus another good reason for learning the "dreaded" Morse code. The code that Wayne seems to hate is what keeps educated, dedicated people in amateur radio; and keeps those who just want a new toy, out. People who are willing to work for something respect it when they get it. How can any non-ham hope to understand the *thrill* and *sense of* accomplishment that comes with self-studying your way to 5 wpm?

Also, despite the fact that I was trained as a radio technician, I've learned more from designing and building my station (entirely home-brew) than I ever did in school. This field teaches electronics, radio theory, and the ever-elusive antenna theory, in a fun way that will continue to interest us younger people.

William Lazure
Kirtland AFB NM

CALL ME

The Novice portion of the 10-meter band still needs an easy-to-remember calling frequency—I suggest 28.1010 MHz. So, get on that channel and give me a call!

Henry Hampel KA0TUP
St. Louis MO

FREE COUNTRY

Wayne, I've never thought much of your editorials. Most of them have made me damn mad, and I've often had to calm myself by saying that this is a free country and everyone has a right to their own *opinion, however* absurd *it* may be.

But your May '87 editorial really hit the nail on the head. I fully agree with you that the ham clubs have got to become more proactive in recruiting and keeping new hams. My own experiences with the local group have been poor. Every once in a while, I go to a meeting to check up on new and interesting items, and I am struck by the members' utter disregard to newcomers! This is not from lack of effort to involve myself, either. I've always filled in the line on the form that asks what committees I'd like to work on, and even said "tell me where you need me"—and I've never even gotten a call.

I'm especially upset about the behavior of the bunch that sold their 220 MHz rigs rather than sharing the band with a bunch of Novices. I guess these guys have forgotten what it's like to be a beginner and need a helping hand.

I'm still a ham, but I've found some hobbies where folks are friendly in person as well as on the air.

Well, Wayne, I've been reading *73* on and off for about fifteen years, I've never agreed with you before, and I may never agree with you again. Thank goodness we live in America!

Jay King N2BEB

NEW PRODUCTS

KENWOOD DUAL BANDER

Kenwood's updated TW-4100A "FM Dual Bander" is easy to operate and is 45 Watts on 2m and 35 Watts on 70cm. Features include GaAsFET front-end receiver, selectable full duplex crossband operation, compact size (5.9 x 1.97 x 7.87 inches), weighs less than four pounds, and has a large, illuminated LCD display and main knob. Frequency coverage is from 142–149 MHz and 440–449.995 MHz. Operation is also possible on certain MARS and CAP frequencies. The TW-4100A has programmable band and memory scan with memory channel lock-out.

Other features include front-panel selectable CTCSS tone (when optional TU-7 is installed) and selectable frequency step for quick and easy QSY. This Dual Bander has 10 memory channels with store frequency, offset, and subtone. A lithium battery provides memory back-up. Two channels store the transmit and receive frequencies independently to allow odd split or cross-band operation.

The TW-4100A also has a non-volatile operating system (no re-programming or board-swapping necessary). Separate antenna ports for VHF and UHF minimize loss and increase reliability and performance.

Various options are also available. These include Digital Channel Link and a multi-function voice synthesizer (VS-2). Other options are MU-1 DCL modem; TU-7 CTCSS encoder; VS-2 voice synthesizer; PG-2N extra DC cable; MA-4000 dual band mobile antenna with duplexer; and MB-11 extra mobile mount.

Manufacturer's suggested retail price $649.95.

For further information on this product contact: Tom Wineland, 2201 East Dominguez St., Long Beach CA 90810 (213) 639-9000.

NEW HEATHKIT LINEAR AMPLIFIER KIT

The new Heathkit linear amplifier kit, SB-1000 provides a full 1000 Watts PEP output on SSB or 850 Watts on CW, as well as full HF coverage for 160–15 meters including 80% of rated output on three WARC bands. It uses a single 3-500Z tube in a high- efficiency circuit and has a hypersil steel E-I core transformer for high-performance operation. It also features a quiet computer-style fan, a stiff full-wave power supply with computer grade capacitors, adjustable ALC and plate and load controls with smooth vernier tuning.

For further information circle Reader Service number 204.

Heathkit High-performance Linear Amplifier.

MODEL HL-725D DUAL BAND AMPLIFIER

Tokyo Hy-Power Labs introduces the HL-725D dual band power amplifier for 144/440 MHz bands with low noise GaAsFET RX preamps.

The HL-725D uses a large heat sink and the circuits of THL's well-established HL-62V and HL-60U models that have proven to be highly reliable and stable. Simultaneous preamp operation of both the 144 MHz and the 440 MHz bands is possible. Various combinations of dual TX and RX amplifiers can be used.

The suggested list price is $329.95.

For more information circle Reader Service number 205.

FM Dual Band Transceiver.

New MFJ Dual Band VHF Antenna Tuners.

TWO NEW ANTENNA TUNERS

MFJ Enterprises introduces two new dual-band VHF antenna tuners that cover both the 144 MHz and the new Novice 220 MHz bands. Both handle 300 Watts PEP and match a wide range of impedances for coax-fed antennas.

The MFJ-921 has a built-in swr/Wattmeter, measures 9x2x3 inches, and retails for $69.95.

The MFJ-920 measures a compact 4 1/2x2x3 inches and retails for $49.95.

Both come with a one-year unconditional warranty. For further information circle Reader Service number 206.

NEW ALL MODE ATV RECEIVER

This new receiver from Wyman Research, Inc., receives FM-ATV on 900 MHz and 450 MHz with video and audio outputs. It also receives AM-ATV on Both 900 and 450 MHz bands with output on Channel 3 or 4.

Some features of the new receiver include 6 MHz audio subcarrier; de-emphasis circuitry for FM-ATV; internal speaker(FM-ATV); GaAsFET circuitry; lighted tuning meter; and a deluxe cabinet. It requires 12 volts at 100 mA.

Suggested retail price $374.95.

For further information circle Reader Service number 207.

MODEL TX70-1 ATV TRANSMITTER

This P.C. Electronics small transmitter (6 x 5.2 x 2.5 inches) enables Technician class or higher to transmit live action color or black and white composite video and audio from cameras, VCRs, or computers. The TX70-1 is a companion to the TVC-4G receiving downconverter. The unit is ideal for those who have a downconverter and now want to transmit without buying a full transceiver.

The unit has the improved KPA5-c transmitter board that adds a video monitor output of the actual modulated rf. The unit comes with one crystal, but has provisions for switching between two frequencies. A mike jack and "push-to-look" jack is available for low impedance dynamic microphones and transmit/receive switching. The external power requirement is 12 to 14 vdc at 500 mA. The antenna connector is type N and a BNC outputs to the receiving downconverter from the built-in rf T/R relay.

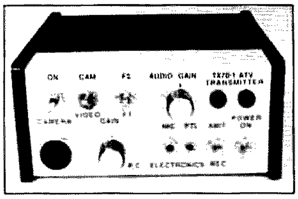
Theoretical snow free line-of-sight DX using the 1-Watt TX70-1, TVC-4G downconverter, and 6-element KLM 440-6X beams is 5 miles. For greater DX with mobile or base applications, the output power and the sync stretcher in the video modulator of the TX70-1 matches the 50-Watt Mirage D24N amplifiers linear input versus output range.

The suggested retail price for the TX70-1 transmitter is $229 for single frequency, and an additional $15 for the second crystal.

For further information circle Reader Service number 208.

KANTRONICS DUAL PORT COMMUNICATOR

The KPC-4™ Dual Port Communicator has two simultaneously operable radio ports both operating at 1200 baud. Features include a watchdog timer for each port, automatic gateway operation between ports, and is command driven with over 100 software commands. The Kantronics



Model TX70-1 1-Watt ATV Transmitter.

Personal Packet Mailbox™ is included as well as an external modem connection point. RS-232 or TTL level operation by jumper selection is also a feature. The KPC-4 also features 32K bytes RAM, 32K bytes EPROM, 512 bytes EEPROM, and 63B03X processor. Also included is a power monitor circuit to control microprocessor reset.

The protocol is the ARRL-adopted AX.25 and the unit is FCC Part 15 compliant.

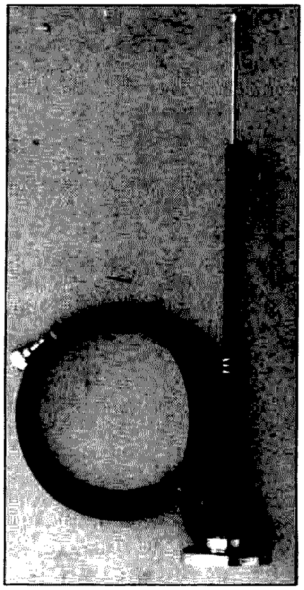
For further information circle Reader Service number 209.

MOBILE ANTENNA

The Austin Tri-Band 2m/1.25m/70cm antenna puts you on the three most active repeater bands with a single 15-inch antenna on your car roof. Functions as a low swr quarterwave vertical on 2m and 1.25m and, a three quarter-wave on 70 cm. Available with or without magnet mount.

Suggested retail price including magnet mount is $62.45 plus $4.50 postage and handling.

For further information on this product circle Reader Service number 210.



Austin Mobile Antenna.

REPEATER CONTROLLER

Creative Control Products new SRC-10 smart repeater controller is low-cost, low power, self-contained, and microprocessor-based. All repeater funtions have been incorporated onto a 4-inch by 6-inch G-10 glass epoxy printed circuit board with one interfacing connector for quality, ease of installation, and reliability.

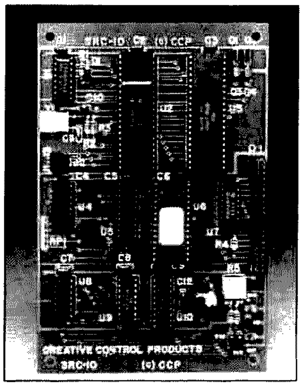
The SRC-10 controller provides up to 7 buffered auxiliary function control outputs that are selected remotely via a 3-digit DTMF touchtone™ command. The unit responds with a Function Complete tone after each valid DTMF command. In addition are Auxiliary Function Tone Responses to indicate on or off condition. Courtesy Tone Responses are available to indicate repeater or link COS (Carrier Operated Switch) activity. A lock command is available that, when it is selected, the controller ignores all DTMF commands until the unlock command is received. This is useful in the case of repeater jammers or hackers.

Additional DTMF commands include repeater and link Courtesy Tones ON/OFF, Master Reset, DTMF Mute ON/OFF, and Force CW ID. In addition to auxiliary outputs the SRC-10 has a Repeater PTT, Link PTT, CW ID, DTMF Mute, and a CTCSS Mode output. Inputs consist of DTMF Audio, Repeater COS, CTCSS Tone, Link COS, and and alarm input for monitoring user installed events (e.g., low-battery, over voltage, intrusion, etc.).

With the optional PI-10/S synthesizer board, the frequency and offsets of the link radio may be programmed remotely. After the frequency and offset is sent in serial format from the controller, it is converted into parallel outputs to interface with the link radio's frequency synthesizer.

The SRC-10's firmware incorporates most options that would be used in a repeater configuration. Customer specified command codes are available for each DTMF function, as well as customer specified CW speed, repeater hang time, and repeater call.

For further information circle Reader Service number 211.



SRC-10 Smart Repeater Controller.

MORSE CODE TUTOR PROGRAM

MFJ Enterprises announces its new MFJ-1266 and MFJ-1267 Morse Code Tutor Program/Iambic Keyer/Keyboard.

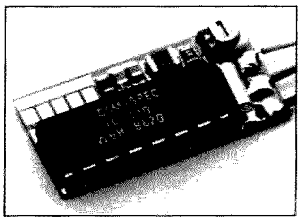
This new full-feature program for the Commodore C-64 and C-128 teaches Morse code and is also a full-fledged iambic keyer and Morse keyboard. With the optional MFJ-76 interface board you can plug in an external keyer paddle and key a transmitter or transceiver.

The program follows the format of the ARRL's "Tune in the World" and can be used with that course or it can be used with the MFJ supplied code learning course.

The Morse Code Tutor features Select Random (lets you select the letters you want to study); Complete Random (sends all alphabet, numbers, and punctuations randomly); Random Message (sends a plain English message exactly as given on an FCC test or received on the air); and Message Store (lets you enter a message from the keyboard and store for sending).

Each mode can use the normal CW spacing or the special Farnsworth spacing, where characters are sent quickly with longer spaces between them. A copy of a test similar to a FCC Novice license test is included in the manual.

For more information circle Reader Service number 212.



SS-32SMP Super-Small CTCSS Encoder.

SUPER SMALL CTCSS ENCODER

Communications Specialists has just introduced a super-small programmable CTCSS encoder for use in handheld radios and other size-restricted applications. The SS-32SMP measures only .53 x 1 x .16 inches and offers full tone versatility and high audio level.

Any 32-tone frequency between .01 Hz and 255.0 Hz may be selected for storage into a 32-bit EEPROM memory. These tone frequencies may be standard or non-standard and may be changed at a later date if desired. The required tone frequency may then be selected by soldering binary coded jumpers on the tone board. The SS-32SMP may also be ordered to work as a six-tone encoder (no switching diodes are necessary) at no extra charge. Multiple tone switching over six tones can be done with switching diode networks or a binary switch. Tone frequencies above 255.0 Hz may be ordered for a slight additional charge.

The SS-32SMP features a low-impedance, low distortion, and adjustable sine wave with adequate audio level to provide sufficient deviation for most handheld radios. It operates on 6–15-vdc so that voltage dropping resistors should never be required.

The SS-32SMP is available with a one-year warranty for immediate delivery for $27.95. A catalogue for our encoder and for our other products is available upon request.

For further information on this product circle Reader Service number 213.

NEW 8-POLE CRYSTAL LATTICE FILTERS

International Radio announces two new 8-pole crystal lattice filters for Kenwood and Yaesu radios.

The IR88H4.OC is an AM filter that has a bandwidth of 4.0 kHz at 6 dB, 2 kHz narrower than the Kenwood AM filter.

The IR88H4.OC is used to replace the Kenwood YK88A1 that is used in the R-5000, TS-940, and TS-930. The new filter comes mounted on a glass PC board like the YK88A1.

The second 8-pole filter is the new IR3.3H2.1 filter. This filter was designed to improve selectivity in the Yaesu FT-101/E/EE series radio and is an exact replacement for the original unit.

The new filter offers 2.1 kHz SSB selectivity at 6 dB and will provide additional razor-sharp selectivity for the above series Yaesu radios.

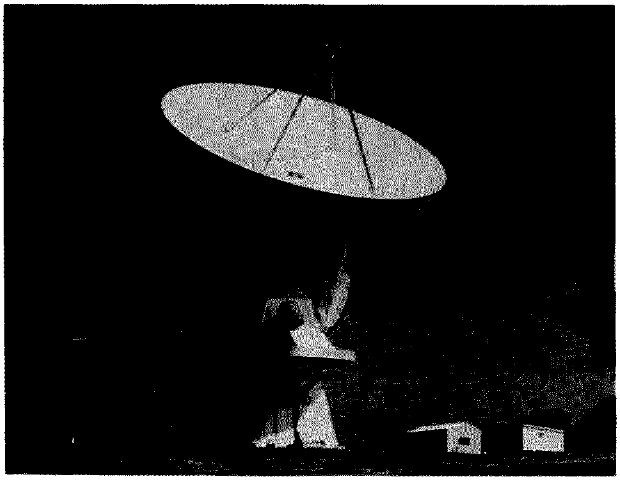
Filters are $60.00 each plus $5.00 shipping and handling U.S.A.; $10.00 Canada and Mexico; $13.00 elsewhere.

For further information circle Reader Service number 214.

Roald Steen AJ0N
6217 Ridge Drive
Woodbury MN 55125

Radio at Green Bank

The active radio observatory at Green Bank, West Virginia, is also a center for preserving some of the major early developments in radio astronomy.



The 140-foot telescope at Green Bank.

One of the most impressive collections of radio atennas in the world is located at Green Bank, West Virginia. This location was selected for the first large system of radio telescopes in the United States for several reasons. The hills surrounding Green Bank protect the site from man-made interference. The area has little industry and few population centers that could cause interference.

Green Bank is a very pretty location. The surrounding hills are covered with forests and in the valley there is little to disturb nature except the large radio telescopes.

Green Bank has become a center for the history of radio astronomy as well as an active radio observatory. A replica of the first antenna that was used to detect radio emissions from space has been constructed near the administration building. The original antenna was built by Karl Jansky, a radio amateur who worked as a scientist at Bell Laboratories in Holmdel, New Jersey.

With his antenna system, Karl Jansky was studying radio noise. The antenna was constructed for a wavelength of 14.6 meters, which is near our 15-meter radio band. He discovered that the strongest noise sources seemed to follow the movement of the sky as the Earth rotated. In 1930 Karl Jansky determined that the band of radio noise that he detected seemed to coincide with the Milky Way and that it was strongest near the constellation Sagittarius, the center of the Milky Way. With the detection of this extraterrestrial radio noise, radio astronomy as a science began.

Another dedicated amateur, Grote Reber, also made great contributions to radio astronomy. Reber, an electrical engineer, built a 31-foot parabolic antenna at his home in Wheaton, Illinois, in 1937. This was the first system built expressly for radio astronomy. With this fully steerable radio telescope, he was able to make a number of important contributions to the new science of radio astronomy, including the first radio map of the sky. This was an impressive private effort—the radio telescope weighed two tons and it took four months to build the observatory.

In 1947 Reber sold his radio telescope to the National Bureau of Standards. The Bureau moved it to their location is Boulder, Colorado, the home of WWV. Here it served the Bureau for a number of years in radio research activities. After the Bureau acquired more advanced equipment, the Reber telescope was disassembled and shipped to Green Bank. Reassembled at Green Bank under the direction of Grote Reber in 1960, it can now be seen there by visitors. The site at Green Bank is listed in the National Registry of Historic Places.

Several other early radio astronomy antennas are also displayed at Green Bank. One, a horn antenna, was used in 1951 to detect neutral hydrogen radio emissions from space. This emission occurs at a frequency of 1.420 GHz and is one of the strongest radio emissions that arrive from space. Concentrated along the plane of the Milky Way, it serves as an important indicator of the structure of our galaxy.

The first large radio telescope at Green Bank was built in 1957/58. The telescope is 85-feet in diameter, fully steerable, and constructed as a parabolic antenna with a cassegrain subreflector. Named the Howard E. Tatel telescope after its designer, it is still in service as part of a 4-element interferometer.

In 1960 the second largest movable radio telescope in the world was built at Green Bank. It is exceeded in size only by the 1000-foot fixed radio telescope at Arecibo in Puerto Rico and a 330-foot movable radio telescope near Bonn, Germany.

This telescope has one disadvantage: it can be moved only in elevation. A movable feed system at the focus of the parabola allows some tracking of objects as they move across the sky due to the earth's rotation, but because this capability is limited, an object can be tracked for only a few minutes. But for many observations this tracking capability is sufficient. It is one of the most valuable facilities of its type in the world, contributing to many discoveries in radio astronomy. The shape, size, and rotation of many galaxies have been mapped by this telescope.

Many pulsars (radio sources in the sky that transmit rapid pulses in a very stable pattern) were first detected with the 300-foot telescope at Green Bank.

Pulsars are believed to be the remnants of supernovas that have exploded in the Milky Way. These stars have contracted, becoming rapidly rotating and extremely small and heavy neutron stars. Pulsars emit radio waves from their magnetic poles and these can be detected each time a pole sweeps past the earth. Despite having traveled several thousand light years, these pulsars haven't been smeared out and, when they arrive on earth, can still be detected in almost the same pattern as when they were emitted from the pulsar.

The observatory is now used to map these pulsar emissions from the Milky Way and other more remote galaxies at the radio frequency of neutral hydrogen (1.420 GHz). This telescope produces far more accurate

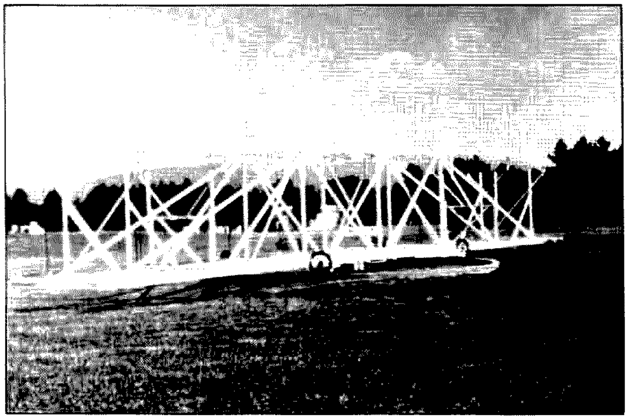


Photo A. A working replica of Karl Jansky's antenna.

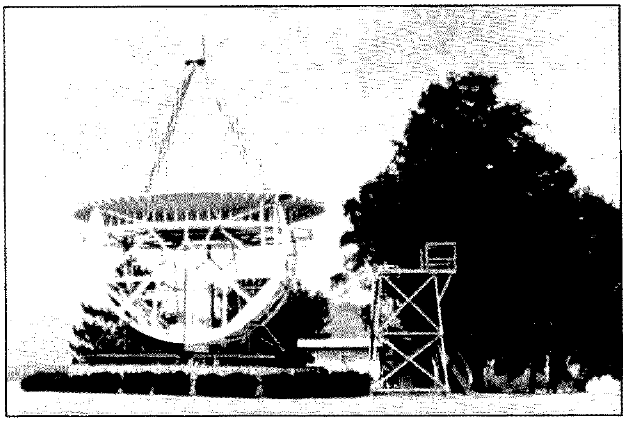


Photo B. The Grote Reber antenna. The first parabolic antenna built for radio astronomy.

maps than the old horn antenna on display nearby.

The largest telescope (140-foot) in the world with an equatorial mounting was built at Green Bank in 1965. Equatorial mounting permits rapid and accurate tracking of objects in the sky. This telescope if often used for Very Long Baseline Interferometry (VLBI) observations in conjunction with observatories in other countries, including the 330-foot telescope in Germany.

To use VLBI technology a radio telescope must have a very smooth surface compared with the shortest wavelengths which it is to observe. The smoothness of the telescope's 140-foot diameter surface is so accurate that it works well at wavelengths of 2 centimeters (15 GHz). By linking several radio telescopes together extremely detailed observations of remote objects can be achieved with the aid of communications satellites or microwave links. The information from the participating radio telescopes is recorded with accurate time measurements on magnetic tape. The (VLBI) technology is as accurate as that which would be possible with a single radio telescope with a diameter equal to the distance between the participating radio observatories.

The 140-foot reflector, constructed in the cassegrain configuration, is able to determine signal frequencies with very high accuracy. Since chemical elements in space emit a variety of radio frequencies, each emission line can be used to identify a chemical element. Doppler shifts in emission lines can then be used to determine the velocity and temperature of the objects being observed.

The 3-element interferometer at Green Bank was the first large one constructed in the United States. (An older interferometer had been constructed only at Jordell Bank in England.) The Green Bank interferometer consists of three 85-foot reflecting antennas, including the original Howard E. Tatel antenna. The Tatel antenna is stationary, the other ones can be moved along a 5000-foot-long track.

The experience gained from the pioneering work done on the Green Bank system was used in constructing the much larger, 27-element interferometer facility in New Mexico (*73*, July 1985).

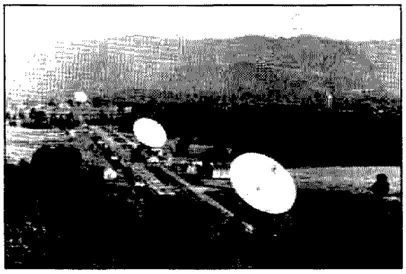


Photo C. The three-element interferometer at Green Bank. The center element has been dismantled ; the two remaining are part of a four-element interferometer dedicated to astronomy.

The three-telescope interferometer at Green Bank has been removed from service. One of the movable antennas has been dismantled; the two remaining are part of a four-element interferometer being used at the U.S. Naval Observatory. This interferometer is the first to be dedicated to the new science of radio astrometry.

Radio astrometry is the science by which the movement and rotation of the earth are accurately measured. For example, wobbles in the earth's motion of a few feet can be detected as well as minute changes in the location of the North and South poles. This science can also provide information on the composition of the inner parts of the planets. The U.S. Naval Observatory uses radio astrometry to produce accurate astronomical tables for navigation.

To accurately determine the earth's motion, very stable reference positions are needed. A four-element interferometer uses remote quasars for reference positions. Quasars are so remote that no movement of them has ever been detected. The earth's motion is measured with the interferometer by checking its movement against the position of a few selected quasars.

Two elements of the four-element interferometer are two 45-foot antennas one at Huntersville, the other at Point Mountain, West Virginia. Both of these locations are about 20 miles from Green Bank.

The Green Bank radio telescopes are owned and operated by the National Radio Astronomy Observatory (NRAO). This organization, which has its main office in Charlottesville, Virginia, also operates the Very Large Array in New Mexico as well as a millimeter wavelength observatory at Kitt Peak in Arizona.

The receiving equipment used in radio astronomy must be of very advanced construction. The receiving front ends are usually cooled with liquid helium in order to maintain a temperature only a few degrees above absolute zero. All components in an electronic circuit produce internal noise while operating. Noise can overwhelm the weak signals being received from space. Cooling reduces this internal noise in the receivers to a very low level.

A variety of receivers is being used at Green Bank. For many of the lower frequencies, Cooled Field Effect transistors are used. Cooled parametric amplifiers are used for higher frequencies, and for the highest frequencies masers are most effective.

The NRAO constructs most of its own receiving equipment at laboratories in Charlotte, Virginia, and Socorro, New Mexico. The majority of radio telescopes are built in the cassegrain configuration. In this configuration a subreflector is mounted at the focus of the parabolic reflector. This subreflector directs the received radio waves to receiving equipment at the center of the parabolic disk.

Because of the weight of the cooling system, it is difficult to support the receiving equipment in the focus of a parabola. With the cassegrain system a more stable position on the parabolic disk is possible. This system also facilitates maintainance. The only exception to the cassegrain system at Green Bank is the 300-foot radio telescope.

Visitors are welcome at Green Bank during the summer. There are daily tours during the week and also on weekends. A short, award-winning movie on radio astronomy begins the free guided bus tour of the radio telescopes. ■

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A Foldover Cheapie

Bowing to the cost of living

A few years ago, I fell heir to several 21-foot (standard-length) pieces of galvanized-steel water pipe, one 2-1/2-inch piece, a 2-inch piece, and others ranging down to 1-inch diameter. The various sizes and long lengths made them much too bulky and heavy for masts and rotor supports in the ordinary way, so they just lay outside my shack to be tripped over occasionally.

Some time later, having to scoot to the top of my 60-foot tower to repair cables and replace guy wires, I got an aerial view of these pipes. Wow! They looked like one of those expensive foldover towers I had seen

> ***"The basic structure . . . is simple and straightforward. Two sections of pipe are telescoped together and hinged near the base. A hand-operated boat winch provides the power."***

advertised in a recent issue of *73*! Deciding that this was "an inspiration from above," I set out "to restack" the pipes vertically so that I could talk *over* them rather than *about* them. There seemed to be plenty of clear area in my yard near the shack where a foldover tower would fit neatly to the ground.

(A survey of space is absolutely necessary should you decide to try this project. The foldover will be no good to you if the antenna folds over into a tree or onto the roof. Also, be careful to align the base so that the butt of the mast does not swing up into the side of your shack as the mast is lowered.)

The basic structure, shown in Figures 1A, 1B, and 1C, is simple and straightforward. Two sections of pipe are telescoped together and hinged near the base. A hand-operated boat winch provides the power. The assembly can take more sections for added height, and these may also be telescoped to prevent top-heaviness and/or add to structural strength, as well as permit greater ease in lowering the antenna in bad weather. A double pulley may be added for more power, or the hinge point raised to provide greater leverage.

I am no engineer, but I can report what worked for me; the purpose of this article is to expose you to a cheap method of building yourself an otherwise-expensive addition to your station. Pay as much attention to the concept as to the step-by-step procedure and let your imagination help you build the assembly which will be exactly right for you.

The job begins with finding an old 55-gallon oil drum. I got mine from a local farm chemical dealer. Similar drums may be found at oil company storage areas or wholsesale cleaning companies (often free for the asking). The drum serves as a modular base for your tower. Next, cut the top out of the drum with a cold chisel. *Don't* take your trusty blowtorch to the top. Many chemicals will produce toxic fumes which could make short work of you, and oil drums tend to explode or burst into flames when exposed to a torch, so do it the hard way. After completing this step, knock several large drain holes into the other end of the drum. This allows the water to drain from the concrete you will pour into it, resulting in faster, and more even, curing. Finally, dig a hole large enough to bury the drum vertically with the top rim just even with the ground. Any projection above ground decreases counterbalance weight for the tower.

The Mast Support

Prepare the base support by clamping a 3" x 3" wood spacer about 3' long between two 10' 3" angle irons (Figure 2) and drill a 5/8"

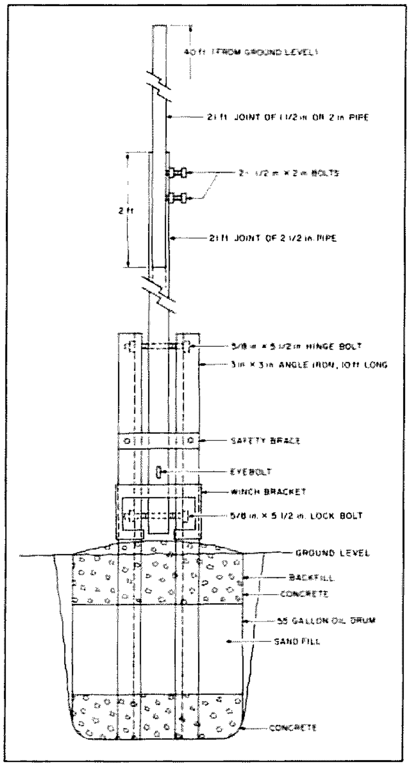

Fig. 1A. Mounting of tower base showing front view of mast-supporting angle brackets.

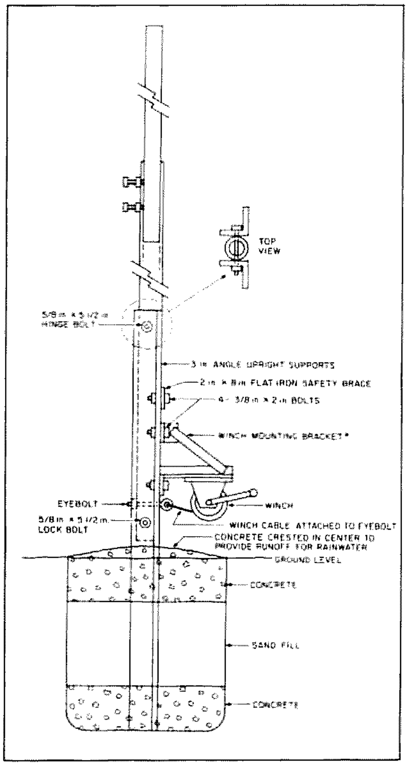

Fig. 1B. Side view of mast-supporting angle brackets and winch installation.

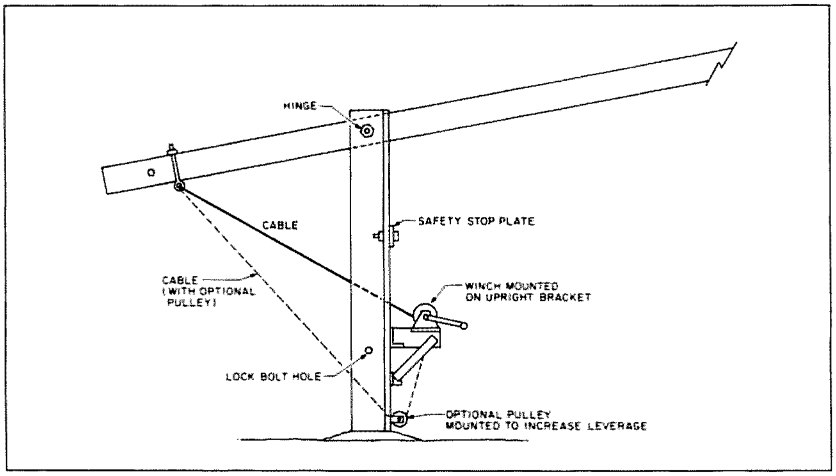

Fig. 1C. Winch assembly for the foldover.

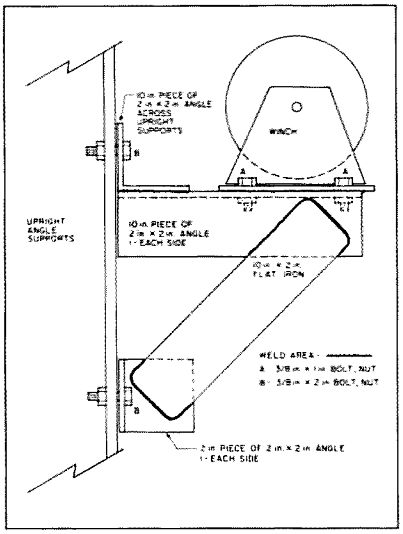

Fig. 2. Details of winch installation.

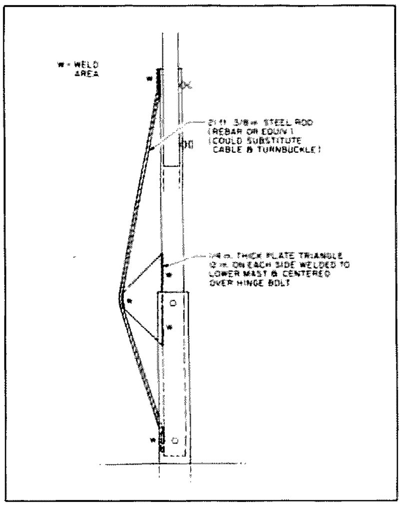

Fig. 3. Truss for lower mast section. Use this when adding another section to the tower.

hole through both pieces, about 3" from the top end. Stand the assembly in your buried drum and mark the level of the ground, using a level or straight edge across the rim of the barrel. Measure up from 6" to 12" and drill another 5/8" hole. This bottom hole will take the locking bolt that will hold the mast vertical once it is raised; the top hole is for the hinge pin for the foldover operation.

Lay the bottom pipe for your tower along the support assembly and mark the pipe at the drilled holes. *Exercise caution here!* There should be around 6" between the ground-level mark on the support assembly and the locking-bolt hole, and the bottom end of the mast must fall within this space. Carefully drill 5/8" holes through the pipe to match the holes in the support assembly. Keep the holes perpendicular to the pipe or the bolts won't align properly.

An alternative procedure would be to clamp the pipe between the angle irons and bore both sets of holes, but this is difficult unless you have adequate clamps and a helping hand. It is hard to clamp and align a round piece between two flat pieces.

Get the Assembly Vertical!

It's a good idea to treat metal which will be in contact with concrete the same way professional tower-installers protect base mounts on commercial towers. An aerosol can of auto-body undercoating can be used. (This is not an option if you are inserting galvanized metal into concrete.)

Now, mix , then pour, about four 60-pound bags of concrete into the drum. You could pour dry mix into the drum and drench with water, but this way it could be weeks before the concrete will be moistened enough to cure. While the concrete is still wet, stand the support assembly upright in the center of the drum, and work it down through the concrete until it hits bottom.

Balance or brace the assembly upright until it can be secured. I used old pieces of TV guy wire and tied it off in three directions. Once it is firmly secured, take your level and make sure the assembly is vertical. Now add sand, dirt, pebbles, or whatever, to the drum, and fill to within 12" to 16" of the rim. *Check your base assembly again to make sure it is still vertical.*

Mix up four to six more bags of ready-mix (as needed) and finish filling the barrel, rounding it off at the top so water will not collect around the mast. Tamp the soil around the barrel, using leftover soil, pebbles, and concrete as necessary to secure the base solidly in the ground. Now make a final, careful check of the plumbness of your assembly and make any last-minute adjustments needed. A very slight bit off vertical here, and your mast could end up looking like the Tower of Pisa!

Take a break and come back tomorrow. Any fooling around with the base now can cause cracks in the concrete where water can seep in and freeze, breaking up the concrete or making all your leveling worthless. Let it harden at least overnight.

Mounting the Mast

The next day, begin by removing the spacer and putting the bottom mast pipe in its place. Insert a 5-1/2 inch 5/8" bolt in the hinge-pin holes, using flat washers on both sides of the mast. Screw on a nut loosely, and raise and lower the mast by hand to check the action and to make sure the bottom holes line up properly. If they do not, clamp the mast firmly upright and drill through the whole assembly.

Mark where the bottom of the mast comes to on the support assembly, and a few inches above the mark securely bolt a piece of 2" x 8" quarter-inch flat iron stock across the flat sides of the angle irons; this piece will stop the mast from swinging further than the vertical position.

With the mast bolted in the vertical position, drill a 3/8" hole in it about 10" from the bottom and insert a 3/8" eyebolt with the eye facing the direction in which the tower will fold. Your winch cable will be fastened to this eye. Use either a welded-eye type bolt or have the eye welded shut. A heavy load can stretch an eye open—and such a mishap can allow a mast being raised or lowered to plummet to the ground with your prized quad and rotor!

The Winch

The winch should be mounted on the same side the tower folds on, at a height that allows easy cranking of the handle. It all works most smoothly if the cable winds up at or near the height at which the eyebolt is attached to the mast—10" to 18" above ground level. My tower has the winch at about waist-height which allows cranking without getting down on your knees, but creates another problem: poor leverage. I had to mount a pulley at the base of the support assembly (see Figure 1C). Feel free to experiment, but beware; I had trouble finding a pulley small enough but sturdy enough, and with the cable tracking over the pulley, and with the mounting of the pulley so that it was not in the way of the mast when vertical. It really is simpler and more economical to mount the winch as low as can be cranked comfortably when kneeling.

When you have decided on a position, mount the boat winch mounting bracket (see Figure 2). You may have an easier method of mounting the winch. Certainly, if you have access to a portable welder, this job can be done much more quickly. Just be sure the winch is centered between the angle-iron supports. The simple bolted arrangement is neat, but I personally suggest that you take the assembly to a welder and then bolt the welded assembly to the supports. (There is other welding that can be done at the same time—see "Adding Height," below.) In any case, the winch assembly must be sturdy. There is a great deal of stress involved in raising and lowering the tower, so this is no place to skimp.

Adding Height

When you have satisfied yourself that your assembly works as you wish it to, it is time to add height to the mast. With it lowered and touching the ground, bore two holes about a foot apart with the top hole about 2″ below the top of the mast (see Figure 3). While you are having your winch welding done, you also can get 1/2″ nuts welded over each of these holes. You could fabricate a clamp for this job to replace the welding. Raise the mast parallel to the ground and slide a 21-foot section of 2″ pipe about two feet into the larger pipe. Screw 2″ bolts into the welded nuts to hold the two pipe sections firmly together. Now you have a 40-foot mast which is adequate for most amateur use.

I have an ATB-34 and a CDE rotor atop my version of this tower and felt more comfortable lowering the top section about halfway into the lower section, resulting in a 30-foot tower. A third section of, for example, 1′1/4″ pipe attached in the same manner, could produce a 60-foot tower. If this is tried, I would suggest welding links of chain, or inserting eyebolts around the top section of pipe about two feet from the top, to allow attachment of guy wires—especially if any substantial antenna array is to be mounted. Getting it up there is one thing, but getting it to stay is another!

I have tried several modifications of this assembly, all the way to 50 feet without guys, including a 6-dB vertical atop stacked 7-element, 2-meter beams. It stayed fine, but I couldn't stand the swaying in the wind as well as the tower did, although the base never budged. However, guy wires would be a necessity in my book if an expanded version of my design is built. It is simple enough to disconnect the guy wires for tower lowering.

Extending the tower to 60 feet or more produces very heavy loads on the winch, even with light arrays. The optional lower-section truss brace eliminates much of the sway and bending when raising or lowering the tower. Over 40 feet you also will need the optional pulley system shown in Fig. 1. This slows operation of the foldover but doubles the effectiveness of the winch. Another possibility would be to build the upright support assembly longer. This will add counterbalance weight—and could also allow the use of larger pipe.

Conclusion

My Foldover Cheapie has been in service for nearly eight years without any problems. It is a perfect platform, even at 20 feet, for antenna experimenters. (At 20 feet you could perhaps use a 30-gallon drum or perhaps no drum at all.) A drum makes sure of enough base weight, and requires about a sixth as much concrete as would a plain hole in the ground. It also helps keep the tower from settling into the ground and cracking skimpy layers of concrete.

A final comment: *Don't try to lift too heavy a tower and load.* You risk breaking the cable and worse. Slide the top section down a little and try it out. I doubt that my range with the ATB-34 is much different at the 36 feet I use that it would be at 40 feet.

Many older hams will enjoy this type of structure because it will allow them the independence of maintaining their own antenna systems. This might make a nifty club project to help some of your older members. It also is an ideal assembly for hams living in areas subject to seasonal high winds. ■

Parts List

2	10′ pieces of 3″ x 3/8″ angle iron
1	21′ piece of 2-1/2″ steel pipe
1	21′ piece of 2″ steel pipe
2	5-1/2″ 5/8″ steel bolts with nuts and washers
2	2″ 3/8″ steel bolts with nuts and washers
1	piece of 1/4″ flat iron stock, 2″ x 10″
1	used 55-gallon drum
1	1000-pound boat winch with cable
2	2″ 1/2″ bolts with nuts and washers
10	60-pound bags of premixed concrete

For Winch Mount

1	piece of 1/4″ flat iron stock 6″ square
2	pieces of 1/4″ flat iron stock 10″ x 1″
3	10″ pieces of 2″ angle iron
2	10″ pieces of 1″ x 1/4″ angle iron
4	2″ 3/8″ bolts with nuts

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Portable Antennas for Out-of-the-Ordinary QTHs

Some ideas for antenna alternatives in unusual situations.

Some time ago at a convention I met a doctor, a medical missionary working at a relief station in the Sudan. Because of his unique QTH, we had an interesting discussion about mobile and portable antennas for communication from the boondocks. His bona fides include the fact that he is licensed to operate on both amateur radio bands and as a land-mobile or point-to-point station in the 6.2 MHz band.

The desert where he travels in one of the worst in the world. Because of the harsh conditions, the doctor's organization requires him to check in twice daily on either 6.2 MHz or 3.885 MHz (that some missionary hams in Africa use as an official calling frequency). If he misses two check-ins in a row, search and rescue planes are sent up. Because of his unique *housecalls*, he does a lot of mobile and portable operating in the lower HF region. His problem? How do you reliably get through the QRM and tropical QRN with only 200 Watts PEP and a standard loaded mobile antenna?

A KL7 government forester I met, who works in Alaska, faces many of the same problems as the doctor in the Sudan (but at temperatures 100 degrees colder). He frequently takes his 100-Watt mobile rig into the back country of Alaska. With only 100 Watts into an inefficiently loaded mobile antenna, how does he reliably cut through QRM to talk to the base station?

An earthquake or hurricane strikes your community, antenna towers collapse, tribanders are tangled masses of aluminum tubing, dipoles are snarled globs of Copperweld, and rig and linear amplifiers are smashed. All that's left is the 100-Watt HF rig in the car. Communications now are not for fun—they're deadly serious! How do *you* establish reliable communications with only a 100-Watt mobile driving a 75-meter loaded whip? Suddenly, the problems of a Sudanese doctor and an Alaskan forester aren't so remote.

Some Problems with Mobile Configurations

Because quarter wavelength antennas on low-HF band frequencies are 30–70 feet high, full-size vertical whip antennas are not practical (in fact, at frequencies below 10 meters full-size whips are rare). A typical short, mobile antenna (Figure 1) exhibits capacitive resistance, so a loading coil is added (L in Figure 1) to the radiator and its inductive reactance cancels the capacitive reactance of the antenna. The inductor can be placed almost anywhere along the radiator, although base, center, and top-loaded designs predominate. The actual inductance needed varies somewhat with coil placement as does antenna performance. (The resonators used on commercial low-HF mobile antennas are loading coils encapsulated in weather-tight housings.)

Mobile configuration is inefficient by nature and little can be done to improve matters. An antenna matching device or tuner helps optimize power transfer and should always be used (especially with solid-state final amplifiers that don't tolerate vswr as easily as do tube finals). With portable configurations, we can improve performance and look into options not available to mobile operators. A basic assumption is that operators needing emergency communication are located in remote areas with no access to the usual VHF bands which would allow them to make contact with emergency services through a repeater autopatch. Here we are dealing with HF rigs operating at the lower end of the HF spectrum in situations where a temporary antenna must be erected.

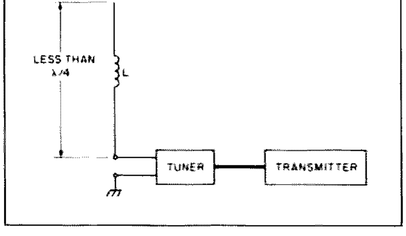

Figure 1. A typical mobile antenna for a low-HF band.

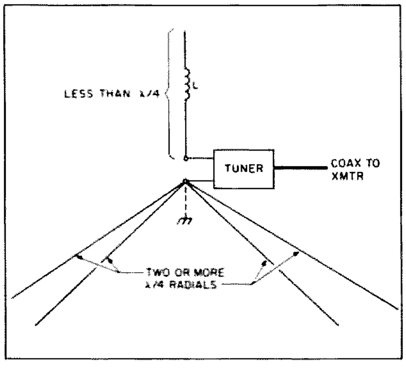

Figure 2A. The electrical system of a counterpoise ground plane.

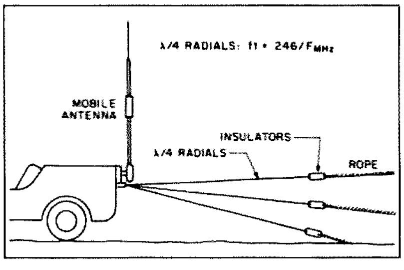

Figure 2B. The mechanical scheme for a counterpoise ground plane.

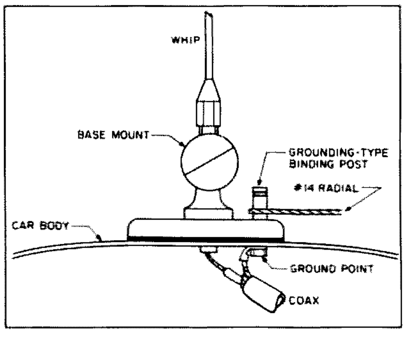

Figure 2C. An improved mobile antenna system, with two #14 radials.

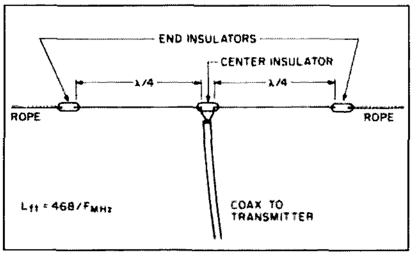

Figure 3. The common dipole and the equation for determining approximate length.

Some Solutions

One solution to these problems is to provide a counterpoise ground plane. The ground plane consists of two or more (even *one* helps) quarter wavelength radials connected to the antenna ground point (i.e., the coaxial cable shield connects to the vehicle body). (See Figures 2A and 2B.) The radials, made of #14 wire, are relatively easy to stow.

A mobile antenna system that shows considerable improvement over the unaided loaded whip, uses the normal basemount attached to the rear quarter panel adjacent to the trunk lid (Figure 2C). An all-metal, grounding binding post is installed through an extra hole drilled in the base insulator. The binding post, though small, easily accomodates two #14 radials.

Another solution is to replace the mobile antenna with a more efficient, stowable antenna that can be erected when needed. A military surplus HF whip antenna intended for jeeps and communication trucks is collapsible and efficient.

The common dipole is also capable of some impressive results. The dipole is made by connecting two quarter wavelength pieces of wire to a coaxial cable transmission line; one length to the center conductor, the other to the shield of the coax. [In an emergency zip (lamp) cord and twisted pairs of hookup wire will do for a transmission line.] Figure 3 illustrates the common dipole and the normal equation for determining approximate length. Actual length is found by trimming length until the vswr drops to its lowest point.

Mounting points for the ends of the dipole aren't always easy to find. Figure 4 shows an alternative antenna that works well for portable operation. This inverted-vee dipole does not need end supports but uses a single center support. Each leg is 6 percent longer than that of a nominal

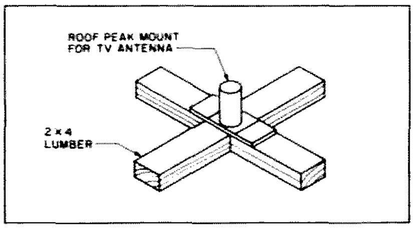

Figure 5A. Base support of 2x4's.

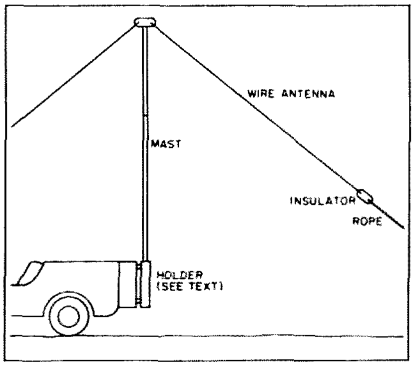

Figure 4. An inverted-vee antenna.

dipole. Since the applications is both temporary and emergency in nature, construction methods unthinkable in a permanent installation are acceptable.

There are three problems: 1) the antenna must be portable for backpackers or stowable for vehicles; 2) what are the materials and means of construction for the mast; and, 3) how is the mast supported?

The Mast

One solution is using a telescoping TV antenna mast to support your antenna. A mobile whip and its associated radials can be mounted at the top, or an inverted vee installed (Figure 4). These masts collapse to 6-8 feet, but can be slipped up to 18, 25, 30, 40, or even 50 feet. Keep in mind that the larger models are heavier and require more than one person to install. Even a 30-foot model can be a bit hairy to install alone.

PVC plastic plumbing pipe can also be used for the inverted-vee antenna. If you're using a vehicle lengths of up to 10 feet are available. Longer lengths can be put together on site by joining one or more sections together with couplings (also available at plumbing supply outlets). However, PVC pipe is flexible and any diameter below 1.5-inch diameter will not stand alone without guying. While a single 10-foot section will stand alone, two or more sections will not support both itself and the weight of the antenna. Guying can be done with ropes, or on a temporary basis, heavy twine.

Another alternative is to carry steel TV antenna masts. These masts, available in 5- and 10-foot lengths, are flared on one end and

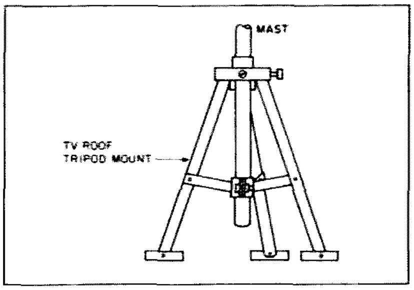

Figure 5B. TV roof tripod mount.

crimped on the other so they can be joined to form longer lengths. Guy wire rings for additional support are also available from suppliers of these masts. Also available are a variety of roof-top mountings that will also aid in ground mounting.

Base Mountings

An unusual solution I saw on the Outer Banks in North Carolina was one used by a CB operator/bass fisherman. Steel tubes welded to either the front or back bumper and usually used for mounting surf casting rods were used by this CB operator to mount two 10-foot TV mast sections. The upper end of the mast was his 11-meter ground plane antenna (Figure 4). This same mounting method could be used for similar amateur antennas, inverted-vee dipoles, or VHF/UHF antennas.

If the antenna installation is short-term and temporary, long-term integrity is not a problem. So, if you plan to camp or are stranded for a few days, mounting the mast to the back of the vehicle with a pair of U-bolts works nicely.

For lightweight masts (up to about 25 feet) an X-shaped base of 2x4's (Figure 5A) or even a Christmas-tree holder will work. A TV antenna tripod (Figure 5B) is also easily adapted for ground use. Of course, none of these three alternatives can be depended on to be self-supporting, but must be guyed even if used for only short periods. Because of the temporary nature of the installation, aluminum or wooden tent pegs work fine in the short run to anchor guy wires.

Another Problem—Electricity

Simple tools are a must for building and repairing simple antennas in the field (for example, a 12-VDC soldering iron that runs off the vehicle battery). There are two alternatives that can be used in providing power—one, the 12-VDC from the vehicle electrical system; or second, operate from 110-VAC generated by a light plant generator.

When boondocking in a four-wheeler or other vehicle, it is wise to use a dual battery system. Two separate 12-VDC auto batteries (with high amp-hour capacity) are connected in parallel with the alternator. Diodes are rated at 100-amps, 50-volt piv, and are used to isolate the two batteries. Such assemblies are available from van conversion and recreational vehicle shops. It's definitely not to anyone's advantage to run down the vehicle battery operating the rig—not only can't you start the truck, but you can't even call for help.

Conclusion

Operating radio communication equipment under primitive conditions depends on two factors: the available electrical power and an effective and efficient antenna system. Without going into detail about getting power in remote locations, I have provided some suggestions that will help you begin planning your own *survival* radio system.■

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Non-Etched Swr Bridge

Measure antenna swr—from 7 to 435 MHz—with this simple, cheap afternoon project.

For over fifty years I have been matching my home-brew antennas to my radio, using makeshift field-strength meters, lamps, pencils (arc), or finger (ouch). My solid-state amplifiers have complained about this treatment, however, forcing me to consider methods that really define the matching in terms of standing-wave ratio (swr). The effort resulted in a very simple device that measures swr to better than 1:1 in all the bands I am interested in, 7 to 435 MHz. It can be built in a few hours for less than five dollars.

The basic method is a stripline-type directional coupler. The operating principle is that a properly terminated line parallel to, and coupled to, the transmission line will pick up energy traveling in one direction. The detected signal from this coupled line will represent either the forward or reflected energy depending upon which end is terminated. Fig. 1 gives the schematic.

Swr values are determined from the forward and reflected peak-voltage outputs:

V(FWD) + V(REFL) / V(FWD) − V(REFL)

The outputs can also be calibrated in terms of power. However, the output-voltage sensitivity of this type of directional coupler is

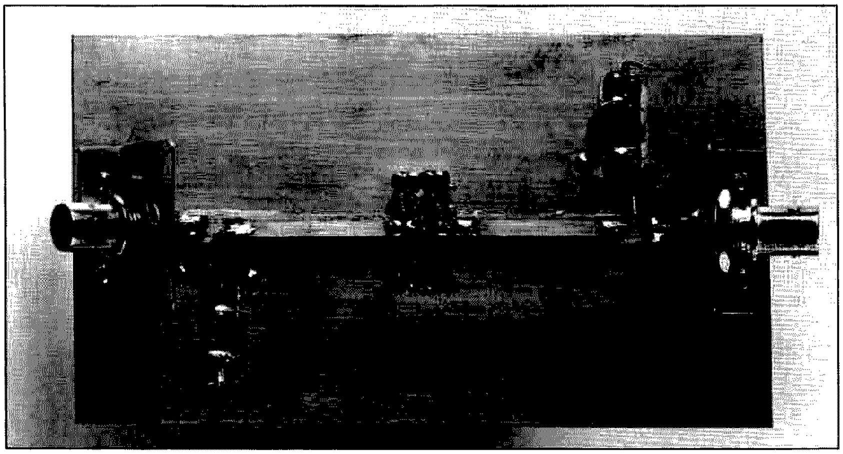


Photo A. Top view of the swr bridge.

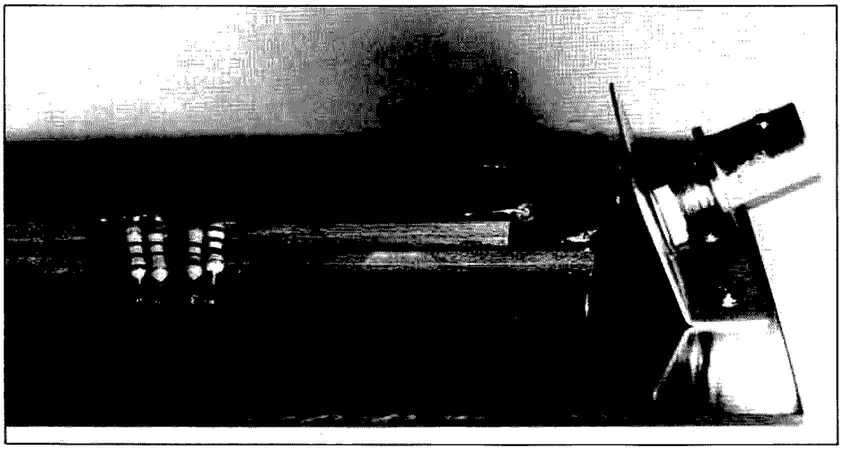


Photo B. Side view of the bridge. Note the stripline mounting.

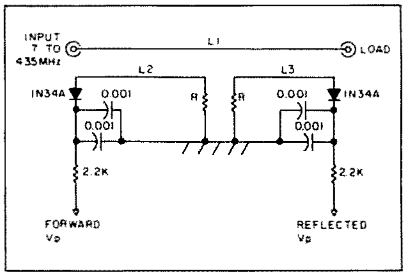


Fig. 1. Schematic for the non-etched swr bridge.

Vp In	Vp Out	Factor
5.00	4.88	1.02
4.0	3.90	1.03
3.0	2.87	1.04
2.0	1.89	1.06
1.0	0.92	1.09
0.8	0.72	1.11
0.6	0.52	1.15
0.5	0.43	1.16
0.4	0.33	1.21
0.3	0.24	1.25
0.2	0.15	1.33
0.1	0.06	1.67
0.05	0.02	2.5

Fig. 2. Peak voltmeter readout. The two columns are input readout characteristics and correction factors.

directly proportional to frequency. As an example, using this particular device at 7 MHz, 100 Watts is required to detect an swr of 1:1, while at 146 MHz, less than 250 mW will make an equivalent measurement. This power/frequency relationship is a limitation.

The effect is in the right direction, however. HF higher power is more likely available than at the VHF/UHF frequencies. Power-handling ability is also frequency related, and it is limited by the coupling-stripline termination resistors. Examples are about 4 W at 435 MHz, 35 W at 146 MHz, and 1 kW at 28 MHz. Total power dissipated at maximum power input is less than one Watt.

This project has been simplified by using a glue-down stripline technique that I have employed successfully in a number of previous projects. Striplines are cut from double-sided glass-epoxy PC board having the same dimensions that you would choose using the etched-PC board method. One side of the stripline is smeared with glue and pressed firmly against the common-base PC board. Changes can be made within minutes by lifting the glue-down stripline with a knife and replacing it with one having the altered dimensions. No dc connection is required between the glue-line foils.

In this project, two striplines are glued together to effectively double the dielectric thickness. This results in a wider stripline for a given impedance, making fabrication and handling easier.

Matching the directional coupler-line impedance with that of the transmission line is a critical parameter, significant differences resulting in a self-generated swr error. Optimum stripline width was calculated using conventional stripline theory. Assuming a 50-Ohm Z_0 (line impedance), the calculations resulted in a 0.219-inch width when using two sandwiched 0.062-inch thick glass-epoxy PC strips having 1.5-ml foils (net 0.118-inch dielectric). A dielectric constant of 4.5 was assumed for the glass-epoxy material. Tests indicate that the floating center foils have no effect.

The pickup lines, glued to the top of the 50-Ohm conducting stripline, are 0.125-inch wide. Although their calculated impedance is 69 Ohms, the termination resistance in this special configuration is about 60 Ohms. This resistance is experimentally pruned to null for zero output when the pickup is in a position to detect reflected energy and when the transmission line is terminated with a non-reflective load (50 Ohms). Pruning is accomplished easily using parallel 4-W resistors.

My assembly required four: two 150s, a 330, and a 2.2k-Ohm resistor. The resistor connections are with minimum lead lengths (approximately 1/32nd inch). The assembly is reverse-connected in the transmission line to enable the pruning procedure for both pickup lines in an identical manner. Lack of fabricating symmetry will result in slightly different resistor values for the two pickup lines.

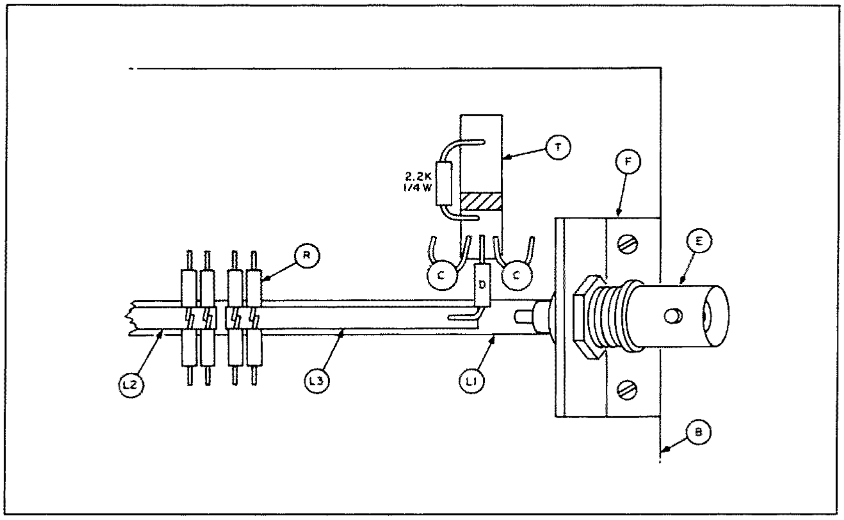


Fig. 3. Fabrication details.

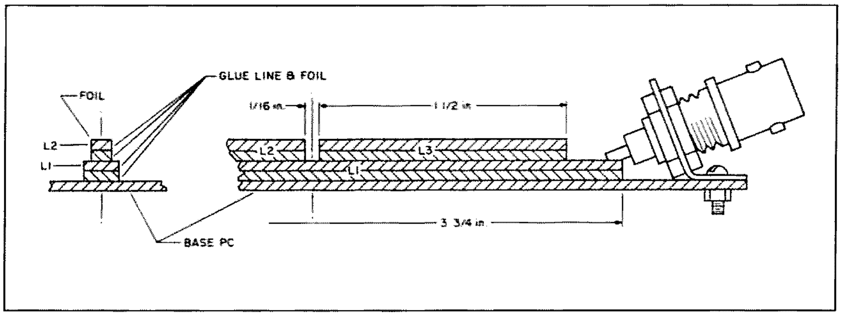


Fig. 4. Stripline cross-section drawing.

A large output-readout dynamic range enhances the usefulness of the device. As an example, only 1.2 V is indicated in the forward direction when used with my 7-MHz, 100-W transmitter. This means that to read a 1:1 swr, it is necessary to detect a reflected voltage of 0.057 V. I have found that selected 1N34As will reliably meet this requirement. In a typical package of ten diodes from Radio Shack, over half of them had a back resistance of more than 10 Megohm (less than 1 uA at 10 V).

Using these selected diodes in the peak-detection circuit together with a high-impedance (10 Megohm) digital voltmeter permits reliable readings down to 0.05 V. The table in Fig. 2 shows input readout characteristics and the correction factors. The required readout sensitivity is a trade-off of how much power is available at a particular frequency and the desired swr- measurement accuracy. The usual ham shack VOM-multimeter will be adequate for most applications.

Fabrication details are shown in the Fig. 3 layout, and the stripline cross-section drawing in Fig. 4. It is best to start by cementing the stripline sandwich and then finish trimming the edges to the required width. A file works fine, however—as does a sandpaper block, which will save dulling your file with the glass epoxy material.

The primary stripline width should be held to 0.219 inch, ± 0.005 inches. I used calipers to size the striplines, but a ruler would be satisfactory if used with considerable care. Maintaining symmetry through the assembly is important. When mounting the BNC chassis connector, use a double nut so that it can be fastened in a position for minimum common-return inductance.

Final alignment is simply pruning the pickup-line termination resistors in the manner mentioned earlier (multiple 1/4-W resistors). It is best to do this procedure at the highest frequency you intend to use the swr device—I used 435 MHz. One thing required is an accurate 50-Ohm termination. I used a fifty-foot section of RG-58/U terminated with two 100-Ohm, 1/4-W resistors. The 7.5-dB cable loss reduces the estimated worst-case resistor reactance swr from a value of 1.2 to 1.03.

R	435 MHz Swr	146 MHz Swr
25	1.7	1.9
50	1.0	1.0
100	1.8	1.7
220	3.9	3.9
330	6.0	6.3
470	9.6	9.5

Fig. 5. Plotting data.

After pruning the terminations of both pickup striplines for minimum reflected indication (less than 1:1 swr), the device is ready to measure any swr of less than 10. The calibration results were made by terminating a short section of RG-58/U with various values of 1/4 W resistors.

Inability to null the swr device may be the result of an error in the primary stripline impedance. This could be caused by a different glass-epoxy dielectric constant. Try alternate striplines differing in widths of about 0.010 inches.

Spurious responses in the transmitted source can cause a measurement error. As an example, a −30 dB spurious signal is likely to result in a significant error when making a 1.1 swr measurement. Also, reflected signals from a reactive source will result in an error. This error will be particularly evident with large swr values.

Connectors also can be a suspect source of error. For example, I have used RG-59/U connectors (75 Ohm) for RG-8M cable (an RG-8 minifoam), and measurements indicate that they contribute to the swr.

How did my home-brew antennas measure? The 435-MHz, 15-element antenna swr was 1.2, the 2m 5-element was 1.4, the 2m J antenna was 1.4, and the 20m flat-top with a tuned antenna coupler at the transmitter was 1.5. That makes sense. I spent more time matching the UHF antenna.

In summation: You can match antennas adequately without an swr instrument, but it's a lot easier if you have this simple gadget. Besides, it's a good way to become acquainted with directional couplers. ■

Notes

1. Microstrip Design Techniques for UHF Amplifiers, Motorola RF Device Data—AN-548A.
2. PCB source (PCB-33), John J. Meshna Jr., Inc., 19 Allerton St., Lynn MA 01904.

Roger Snoke KB6MIF
339 West Artesia St.
Pomona CA 91768

A 220-MHz Portable Pocket J-Pole

Here's a cheap, quick, "handie" antenna that gives you 2-dB more signal than a half-wave pullout whip!

The 220 MHz portable pocket J-pole got its first test under actual emergency conditions. The phones in a large area of the Continental Telephone System were out of order due to a malfunction in San Bernardino CA. As a RACES member, I was called in to assist the Sheriff's Department to keep communications open for county services.

I was assigned to the San Bernardino County Jail. All lines were out and no communication was possible from the jail. The rubber duck on my HT was useless because the command center inside the jail is surrounded by solid, 12-inch-thick concrete walls and a heavy network of steel bars. The RACES 2-meter repeater was also unusable because I couldn't get a break between a flood of local hams flocking to a nearby electronics swap meet.

Solution? I hung my 220-MHz portable pocket J-pole from the jail's acoustic tile ceiling with a piece of masking tape and plugged it in my ICOM 3-AT. On 150 milliwatts, I brought up the 224.34 N6ENV repeater in Running Springs full-scale. With 5 x 9 copy I passed traffic on the technical status of the malfunctioning telephone lines to Perry Westrope WA6LLB, chief RACES radio officer, at his shack 20 miles away in Upland CA. Perry then relayed these messages, via telephone, to the San Bernardino Communications Center. We stood by for routine traffic all day—no problem!

Building The J-Pole

For those active on 220, here is an excellent project that won't take very long, and will greatly improve your HT signal.

Take a 3 1/2-foot piece of TV 300-Ohm twinlead and strip the insulation from each conductor down 1/2-inch. Twist the two pieces together and solder at the bottom end.

Next, measure 38 3/16 inches up from this J-connection and cut the twin lead.

The next step is to measure up one side 13 1/4 inches and cut away 1/4-inch from one conductor. You now have a .94/2 wave radiator and a 1/4-inch wave ground tuning stub.

Now cut a piece of RG-58/U coax about 8 feet long. (I cut mine 24 feet, but I have big pockets and like to climb trees.) Then solder on a coax connector for your HT.

Expose the twinlead conductors at a point 2 inches up from the bottom. Solder securely the ground or braid side of the coax to the short conductor. Solder the center coax conductor to the long side of the twinlead. Make sure you have good connections and separate them with electrical tape. Then wrap this connection and the bottom J-connection with tape.

For the last step, tie a piece of string to the top and secure it with electrical tape.

You can hang the antenna anywhere convenient, but make sure it's at least two wavelengths (2.5 meters) away from any large metal objects.

This antenna delivers 2-dB more signal than the 1/2 wave pullout whip that is much more expensive. And, of course, it is far superior to the rubber duck.

Good luck and enjoy 220 MHz! ■

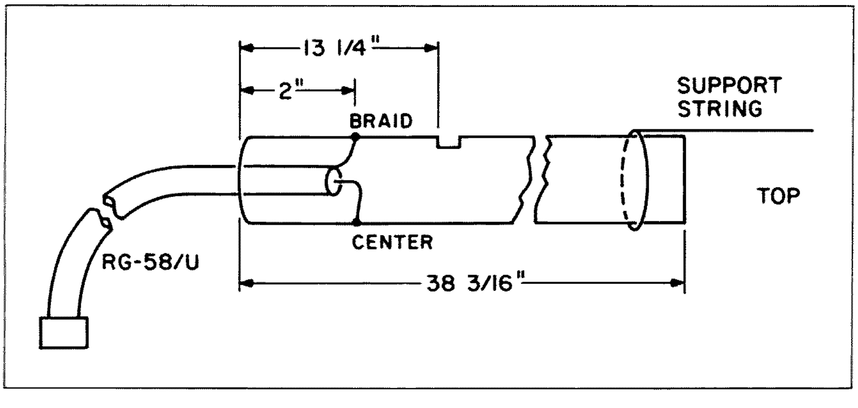


Diagram of the 220 MHz Portable Pocket J-Pole.

Photo A. Roger Snoke KB6MIF using the J-pole he built.

ICOM IC-03AT Yaesu FT-109RH 220-MHz Hand-Held Transceivers

ICOM America, Inc.
2380–116th Ave. NE
Bellevue WA 98004
Price class: $450

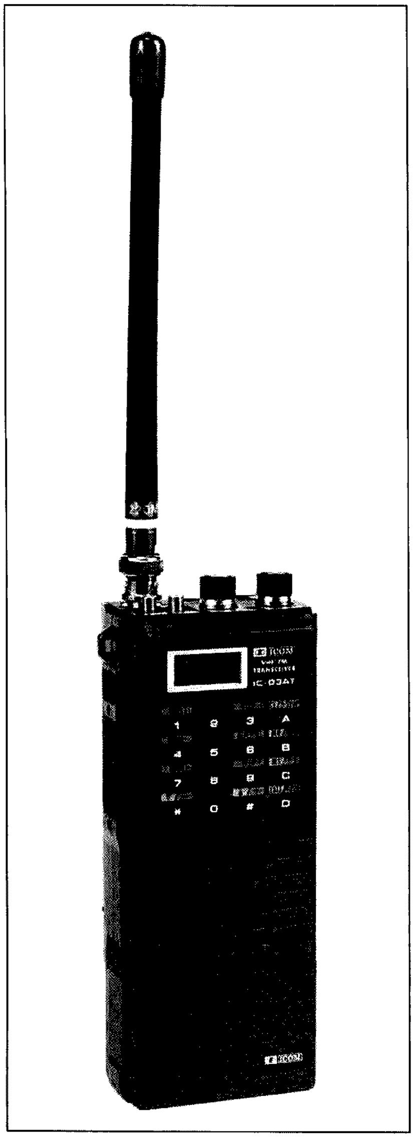
by Peter H. Putman KT2B

Yaesu USA
17210 Edwards Rd.
Cerritos CA 90701
Price class: $380

This month, we'll continue our analysis of radios of special interest to Novices. Both the Yaesu FT-109RH and ICOM IC-03AT are full-featured hand-helds for the 220 enthusiast. They represent both companies top-of-the-line models (to date).

Refer to the photographs for a size comparison. Right away you'll note the large 500 mA battery pack on the FT-109RH—similar to the pack used on the FT-727 dual band HT. This increases the size of the radio but also expands the battery life and allows much higher output power. The IC-03AT checks in with the standard 270 mA pack for a lower profile and correspondingly less output. Can't get something for nothing, right?

Both hand-helds come in durable, attractive, metal cases with the Yaesu finished in gray and the ICOM in dark green. Both have easy-to-read LCD displays, with the FT-109RH display larger, at 1 1/4" x 1/2", than the IC-03AT's 7/8" x 3/8" readout. The numbers stood out better on the IC-03AT, however, in bright light. Both units feature a lamp switch to use under low light conditions. The ICOM uses a push-on/push-off type, while the Yaesu employs a momentary switch about where your thumb would be. I much prefer the latter arrangement, since you only need the lamp briefly to set up the desired frequency.



The IC-03AT...

...and its contender, the FT-109RH.

Coverage is identical on both models, with receive and transmit displayed and enabled from 220.000–224.990 MHz. The IC-03AT volume and squelch controls are textured rubber knobs for an easy grip, making them far easier to use than the lower profile Yaesu plastic knobs. Both radios employ a HI/LO rf-power switch on top, and both use a sub-mini jack for an external microphone and a mini jack for an earphone. (Anticipating your next question...the speaker/mikes are *not* interchangeable between the two radios.)

ICOM provides an external dc power jack on top of the HT, while Yaesu makes this connection through the bottom of the FNB-4 battery pack. The FT-109RH also has two buttons to control VOX keying and VOX sensitivity. This option is not available on the IC-03AT, unless you purchase the optional HS-10 and HS-10A headset/VOX unit. With the FT-109RH, you'll just need either the YH-2 headset or MH-12A2B speaker mike.

Both hand-helds have a shifted keypad for both DTMF signaling and frequency selection. To shift the keypad on the FT-109RH, you need to depress the yellow "F" key first, then select the desired function. Only one keystroke is permitted per selection of the "F" key. On the IC-03AT, you have to depress a FUNC key above the PTT bar on the side of the radio, but as long as it is depressed you can select as many shifted functions as you want.

For example, let's say you wanted to select a sub-audible tone frequency from the optional FTS-6 Tone Unit, then a repeater offset, then shut off the audible "beep" when keystroking, and finally program it all into memory. With the Yaesu you need to depress the "F" key each time you execute one of the previous functions, which is a bit time-consuming. On the ICOM, you just park your thumb on the FUNC key and away you go for as long as you want. (Incidentally, the "F" key times out after three seconds on the FT-109RH, if no keystrokes are entered.)

Both radios come with a full complement of memories. The FT-109RH allows storage of ten frequencies, each with its own offset information and tone squelch data (as required). The IC-03AT also permits storage of up to ten

different frequencies along with the necessary offsets and tone frequency information. One note here: The IC-03AT comes equipped for CTCSS tone generation—no optional tone generator is needed.

Scan modes are also similar. The IC-03AT provides for memory scan, as well as programmable scan (between any two frequencies). The FT-109RH goes a bit further by also allowing you to lock out certain channels you don't wish to scan, as well as providing a priority channel (also included on the IC-03AT). In addition, the FT-109RH features a call channel in memory position 0, which can be accessed by simply tapping that button. Yaesu intended this to be used on the national calling frequency or close to it (223.50 MHz) with a rapid QSY to another channel the next step.

The IC-03AT displays power output and received-signal strength through the use of an LCD bar graph display. In high power, the bar graph covers the bottom of the display, and in low power it covers about half the display. The FT-109RH uses a more conventional analog meter for both functions, which came as a bit of a surprise in this day of all-in-one LCD displays! High and low power readings are then taken from the analog meter. It does triple duty by showing you the battery condition, a function called out by an arrow pointing downward on the IC-03AT when it's time to recharge.

As you've no doubt gathered by now, the two radios are very similar in operating features, power, and size. How about performance? Hard to pick one over the other there, as well. See Table 1 for test bench data.

Here are some hands-on observations. I found the displays about equal in readability under both bright and dim light conditions. The FT-109RH multi-function display tells you more about what's going on in the radio than the IC-03AT, with the latter using very small characters to show tone select, battery low, scan, etc.

The knobs are very much easier to use on the IC-03AT than the FT-109RH, and appear to be stronger. The keypad on the IC-03AT gives a better detent feeling when depressed than the FT-109RH, and looks to more sturdily constructed. I also preferred the shift function the way it's set up on the IC-03AT to the repeated striking of the "F" key on the FT-109RH.

However, the microphone on the IC-03AT is way down the front panel near the battery pack, which is a safe move on the IC-12AT, but doesn't make sense here. The microphone on the FT-109RH is situated just above the meter display, about where you'd want it while transmitting.

The received-signal indicator on the FT-109RH is calibrated in increments from 1 to 10 (which doesn't mean much of anything) while the IC-03AT's LCD display isn't calibrated in any manner at all. (Hey—either you're full-quieting on FM, or you're not—right?) Having the higher power on the FT-109H was nice and it also has a programmable receive interval to extend battery life. This feature is not available on the IC-03AT, although with the standard battery pack or a NiCd make-it-yourself pack such as the BP-4, battery life shouldn't be a problem.

Received audio reports favored the Yaesu almost unanimously. Receiver audio output appeared to be higher as well, despite the FT-109RH's rating of 450 mW @ 8 Ohms vs. the IC-03AT's 500 mW @ 8 Ohms. The audio output had more of a high frequency component than the IC-03AT and thus sounded crisper. It did seem that I went through a charge faster on the FT-109RH, which makes sense when running 5 Watts output. I didn't have a chance to try the Power Save circuit that allows the user to leave the unit on one channel and have the receiver power up for only 300 milliseconds to check for activity at frequent intervals.

Both radios came supplied with rubber duck antennas, although the IC-03AT has the full-size duck and the Yaesu uses a "mini" duck. I guess the latter is to save on size, but replacing the "mini" with a regular duck will make a drastic improvement in your signal. Of course, you can use 1/4 wave whips with either radio for even better performance. Both radios also use the now-standard slide-lock battery pack system for quick changing of batteries, and the brackets used were equally secure.

Out of the box, the ICOM is far easier to set up, since the Yaesu includes numerous CPU functions that I personally have no interest in. Both manuals are clearly written, with the ICOM getting extra credit for a step-by-step pictoral diagram showing how to set up a function, transmit, program offsets, load memories, etc. As far as accessories go, the FT-109RH is interchangeable with the 209 and 709 series, and uses the same battery pack as the FT-727 dual band HT. The IC-03AT is interchangeable with accessories from the 02/04 series, as well as the 2AT/3AT/4AT radios.

And The Winner Is. . .

There are so many similarities between these two radios that I wonder at times if they aren't both made by the same company in Japan! (Even the supplied wall chargers are virtually identical!) I'd have to give the edge to the FT-109RH as far as its crisper audio, higher power and battery-saving circuit. I preferred the lower profile and cleaner look of the IC-03AT, but with the FNB-3 pack, the Yaesu is about the same in overall size.

Actually, the real winner is you—both radios yield excellent performance for the money spent. ■

Specification	IC-03AT	FT-109RH
Coverage	220.00-224.99	220.00-224.9
Power out		
High	3.0 Watts (BP-3)	5.5 Watts (FNB-4)
Low	500 mW	500 mW
Receiver Sensitivity,		
10 dB of quieting	.25 uV	.25 uV
20 dB of quieting	.5 uV	.5 uV
Squelch Law (Sensitivity)	.18 uV	.2 uV

(Note that the supplied battery packs for each radio determine the power output. The IC-03AT can be raised to about 5 Watts output by purchasing the optional BP-7 450 mAH pack, which will yield about the same output as the FT-109RH.)

Table 1.

Sangean ATS-803 Shortwave Receiver

Sangean America, Inc.
8531 Wellsford Pl., Suite K
Santa Fe Springs CA 90670

by Marc Stern N1BLH

There's a new shortwave receiver on the market, the Sangean ATS-803. A portable, it is Sangean's top-of-the-line, fully synthesized model.

The ATS-803 boasts a large range of features, which include a dual-conversion, superheterodyne receiver section, FM broadcast coverage, and full coverage of the LW, MW, and SW bands from 150 kHz to 30 MHz. In its AM mode, you have continuous coverage of its frequency range, while the SW (shortwave) mode gives you direct access to 120, 90, 75, 60, 49, 41, 31, 25, 19, 16, 13, and 11 meters. It also features a large liquid crystal readout, microcomputer control with 14 memories (5 of which store mode as well as frequency), automatic scanning, memory recall, adjustable gain, a beat-frequency oscillator, and a five-bar LED received signal-strength meter.

We could keep listing specifications, all of which would show that this is a highly capable shortwave receiver. But looks and lists can be deceiving.

> *"We could keep listing specifications, all of which would show that this is a highly capable shortwave receiver. But looks and lists can be deceiving."*

The ATS-803 features manual as well as electronic tuning. The analog tuner is too broad; with the display advancing in increments of 20 kHz or more. How would you feel about having to listen to your tuning? With the ATS-803, you hear a constant blip-blip-blip as you tune up or down the band with the manual tuning. How would you feel with a receiver that looks as if it has stereo capability, but you are forced to use a pair of stereo headphones to take advantage of it? We were more than a little surprised to have tuned up a stereo station, only to find the speaker still playing mono. The instructions do explain the need for the headphones, but this isn't indicated at all on the radio itself. The radio has a balance control and a prominently displayed STEREO indicator.

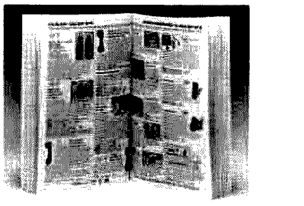
The ATS-803 looks remarkably like other microcomputer-controlled receivers on the market, such as the Sony series, but it has a feature which the others lack: a bfo (beat-frequency oscillator). Other microcomputer-controlled receivers automate this function. The bfo would be a nice idea if it was easy to use, but it really isn't. Once you've found a CW or SSB signal you want to hear, you have to spend some time turning a slightly-raised knob until the signal is best: with CW, it was possible to do this fairly quickly, but on SSB, it was more difficult and time-consuming. In fact, it was nearly impossible at times to tune SSB signals with any great regularity. A couple of times, when we wished to find LSB, we had to turn the bfo into the USB area and vice versa. Sangean should have included automatic mode selection. It is also confusing at first to tune for CW or SSB: you must leave the ATS-803 in the AM mode, and switch a microswitch to the bfo setting.

We evaluated the ATS-803's receive capability. The ATS-803 was evaluated in a high-rf environment, created by local high-powered HF, VHF, and UHF transmitters, from a variety of government and private sources. The ATS-803's performance was compared to several other receivers, including the Kenwood R-1000. On the Kenwood and others, we attached a random length of wire as an antenna about three feet long; the ATS-803 used its built-in, 54-inch, telescoping antenna. With these antennas, we tuned to WWV on 10 MHz, and the result was little more than noise on the ATS-803, while the Kenwood received WWV quite clearly at about S-2. At times, signals seemed to overwhelm the ATS-803's front end, and it would lock up, with the signal strength LEDs all glowing brightly.

We noticed also that the ATS-803 had too many birdies. We found that it would constantly lock up and display a full bank of LEDs when there were no signals present, as though the ATS-803 was hearing its own microprocessor and microelectronic circuitry.

On the plus side, the controls are well laid out and large enough so they can be easily used. The keypad has large keys that feel positive, like the band selector keys. There's a large EXECUTE key which enters the frequency you have punched into the keypad, and there are two large up and down keys which allow you to step through a range of frequencies. Here, you also hear the blip-blip noise during tuning. There are also slide switches for the stereo balance, bass and treble, and volume, and there are momentary-contact switches for a "sleep" feature and panel light. There are also outputs available for a tape recorder, as well as for an external antenna and stereo headphones. There's also more than enough audio from the 4.5-inch speaker.

There's quite a list of features, but prospective buyers should be aware of the faults we found with the ATS-803. In the final analysis, we feel this radio was a good attempt, but, in light of the competition on the market, falls short of the mark. Circle Reader Service Card Number 202. ■



Dick Smith VHF Wattmeter

Dick Smith Electronics
PO Box 8021
Redwood City CA 94036
Price class: $39.95

by Allan J. Perrins WB6PHE

It is impossible to know if your are getting the most out of your rig and antenna system without a good wattmeter. When it comes to wattmeters, there is little argument that the Bird 43 is the best. However, the price of a Bird and its plug-ins is out of the reach of many hams.

Now, however, a cheap, high-quality alternative is available. Dick Smith Electronics has recently introduced a VHF version of their popular UHF wattmeter. The K-6611 wattmeter is an insertion type device capable of both forward- and reverse-power measurements. Its two ranges are 0–30 and 0–150 watts full-scale, and insertion loss is less than .1 dB. Although specified for use in the 144–148 MHz band, it is usable at 220–225 MHz with slightly less accuracy.

Construction is straightforward and can be completed in about two hours. You should begin by reading the manual and errata very caredfully. The mounting of the feed-through caps is a little unclear. The photo on page three of the manual shows the feed caps in the upper-right and lower-left corners of the main PC board. This is correct, but the photo fails to show that the outermost end is made into a loop for "flying leads", as the Aussies call them. These are the leads from the switchboard and the meter.

"The K-6611 wattmeter is an insertion-type device capable of both forward- and reverse-power measurements."

There are 10 pins to be soldered to the main board to provide a good low-impedance rf path. The manual doesn't tell you that they are also used for spacing to the tin-plate bracket used as a ground plane for the input and output connectors. I had cut all of mine off (good rf practice) and discovered that the main board didn't fit properly. Fortunately, I had some left over from another kit.

Be sure to follow the errata sheet for the assembly of the stripline board. The manual text is in error and the unit won't work otherwise.

Mounting the sockets makes for interesting construction, since you have to work inside the case. Use a 3/4-inch box wrench to tighten the SO-239 nuts. Screwing a PL-259 onto the socket will make it easier to hold during this process. After tightening the sockets, test the fit of the assembled microstrip board over the socket center pins. There is a small amount of play in the holes for the SO-239's and I found that I had to mount them as far outside as they would go so that the PC board would fit. This was the most difficult part.

Construction of the switchboard is straightforward. Follow the instructions in the manual and it will be clear that the pots mount on the opposite side of the board from the switches. Two of the "flying leads" have ferrite beads on them. I used ordinary rubber cement to secure them, rather than epoxy as the manual suggests. Silicone sealer would have worked as well.

There is a custom face provided for the meter movement. It's screened for the nomenclature of the front panel switches as well as for two calibrated power scales. The screws for the new face are taped to its rear and are quite small, so be careful not to lose them.

The calibration instructions were easy to follow and gave satisfactory results. A small improvement in accuracy was gained when the unit was claibrated against a Bird 43, but this effort will hardly be necessary for most users.

The finished unit is very professional looking. The case is black, anodized aluminum with rounded seams and recessed end caps. I did find that the end-cap screws protruded somewhat, making the unit a little unstable on a table top. Four self-adhesive rubber feet fixed that little problem. The other small item is that the connectors on the back are not marked for input and output. Looking at the unit from the rear, the right SO-239 is the input and the left one is the output. You will have to use your judgment when checking forward- and reverse-power readings to see if you have hooked up the input and output lines correctly.

The Dick Smith UHF Wattmeter will make a fine addition to Reader Service number 201. ■

Peter H. Putman KT2B
3353 Fieldstone Dr.
Doylestown PA 18901

Horseflies And Grid Squares

Pete Putman KT2B and crew brave the elements on a VHF/UHF DXpedition to grid square FM27

It was the best of times . . . it was also the wettest of times. And with apologies to Charles Dickens, it was also the craziest of times! The scene was our recent S.C.O.R.E. DXpedition to Chincoteague Island, Virginia (Grid Square FM27) for the June VHF QSO Party.

Background

I had given some thought in February to such a junket to activate a rare grid square and FM27 kept coming to mind. Most of this grid lies either in the Atlantic Ocean or Chesapeake Bay, with just a small section of the DelMarVa peninsula running through it. Chincoteague seemed to be the best location. It's located along the ocean (great for tropospheric scatter) and is easily accessible by car—important especially for us, since we wanted to use a crank-up tower trailer with multiple VHF/UHF yagi beams.

FM27 has long been a desirable catch for VHF and UHF types, and the mention of a possible trip perked many an ear of those on 220, 432, 902, and 1296. Long-time residents Ken Birmingham WB2IFC and his wife Sandra WB2GRI have done a pretty good job of giving out the grid on 6 and 2 in previous contests, but the station complement doesn't include anything above 2 meters—at least for now. And Ken has been getting overwhelmed with requests for FM27 lately, so . . .

. . . S.C.O.R.E to the rescue! Our group (Society of Contest Operators and Radio Experimenters) was formed just for times like these. A rare grid . . . UHF and VHF operation . . . lots of custom antennas and rigs for portable use . . . plenty of travelling. That's what brought SCORE into existence, and the lure of Chincoteague was too powerful to resist. Knowing we would be in demand meant selecting reliable but simple stations for each of the six bands from 50 to 1296 MHz to minimize downtime and maximize the QSO rate.

It was only a matter of time before Ivars Lauzums KC2PX, and Steve Katz WB2WIK decided to come aboard and offer their talents. Steve, a veteran VHF contester, could well imagine the possibilities of an ocean side operation, especially on the UHF bands. Ivars, of course, distributes Microwave Modules and Tonna antennas, and has racked up a few pretty impressive scores himself running single operator.

We decided to use as many high-gain yagis as the 51-foot tower trailer could accomodate. Weight was also a consideration, so we chose to do it the French way and use Tonna yagis on every band, except 220, where no comparable Tonna product exists. So, we purchased a 17-element Cushcraft 220B Boomer for this purpose. Ivars suggested using stacked 55-element yagis for 1296 and stacked 23-element yagis on 902—both sharing a common H-frame and both secured near the top of the 16-foot mast.

On 6 meters, we'd split time between a 7-element KLM-LD as our primary antenna (because of its light weight and excellent front-to-back (F/B) ratio), and a secondary 5-element Tonna for fixed-mount service pointing southwest for sustained Sporadic-E contacts. Its F/B ratio is not nearly as good; but it goes together in a snap, loads up easily, and is fairly broad, with nearly 70 degrees across the main lobe—perfect for general Es work.

Two meters was an easy choice, the 17-element Tonna with Trigon reflector. I evaluated one of these last January and found it about as good as the standard 32-19 Boomer, a somewhat heavier antenna. We rounded the complement of antennas out with 2, 21-element Tonna 432 yagis and a power divider, which made for an awful lot of hardware on that 16-foot piece of aluminum. We decided to use 9913 for all feedlines above 220, since it's light, reasonably flexible, and offers fairly low-loss characteristics at 432, 902 and 1296 MHz.

The tower trailer itself is a clever design. It

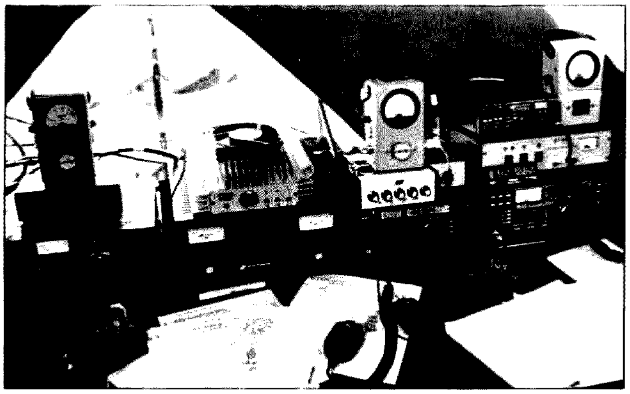


Photo A. The UHF station at WB2WIK/4. From left to right are the 220-, 432-, 902-, and 1296-MHz stations.

Photo B. Ivars KC2PX plugs away on 432 MHz.

was built by Mike Crawford WA2VUN (whose DX-86 on a pedestal appeared in the September 1986 *73 Magazine*). Mike selected a stock Tri-Ex W-51 crank-up tower and designed a special mobile trailer with supports and bracing on the tower, as well as outriggers for extra stability. It works very well and has been used on numerous contest operations as well as Field Day. Ivars preassembled all of the yagis at his warehouse to facilitate on-site installation. The plan was to secure what he could to the tower trailer with shock cords and carry the rest in his Aerostar van.

After a lot of correspondence, I got permission from the Town of Chincoteague to use a public harbor facility. We scheduled our arrival for mid-afternoon, Friday, June 12 to pick out a site.

For the station, I lined up three ICOM IC-740 HF radios with Microwave Module transverters. A reliable setup I'd used many times before and had complete confidence in. Steve WB2WIK arranged to get an SSB Electronics LT33S with a companion Down East Microwave 20-watt "brick" so we could try our hand at 33-cm operation for the first time. My old trustworthy TR9000 even got into the act as the 2-meter i-f stage. You can't keep a good rig down!

And Away We Go

Friday, June 12th was somewhat overcast, but warm. I made a quick trip to U-Haul and rented a pair of 12-foot, screened tents—one to operate from, and one to sleep in. Of course, our most important piece of equipment was a 120-pound Honda 4000-watt generator that is extremely quiet.

Our proposed site had no electricity convenient to it, so a generator was a must. We also felt it might be more reliable if lightning did hit and took commercial main service down.

We had a hard time packing everything up, but managed. Ivars' van was packed to the teeth, and we had to extend his trailer platform with two long tables so we could pile additional stuff on it. Everything was strapped down (including Ivars to his steering wheel) with 5 miles of bunji cords, leaving just enough room in the car for additional camp stuff, clothes, cameras, and a personal computer for logging and duping on site.

It took us about six hours to make the trip. Everett Palmer, the harbor master apparently had no idea when we'd arrive, so, when we did arrive around 6:00 p.m., we had no idea where to set up. After a quick survey, we chose a spot near the southeastern end of the docks—a fairly remote spot on flat, dry ground (which we found out later wasn't the case!) with several nearby dunes to provide a windbreak from the stiff, southwesterly breeze. We set about getting things in order.

Our fourth operator, Rich Whiten WB2OTK was en route from Greenville, South Carolina and hadn't checked in on 144.200 SSB yet, so we set about clearing everything from the tower trailer as ominous clouds began to roll in from the west. Everett showed up about an hour later and gave us the pleasant news that a severe storm warning was in effect until 9

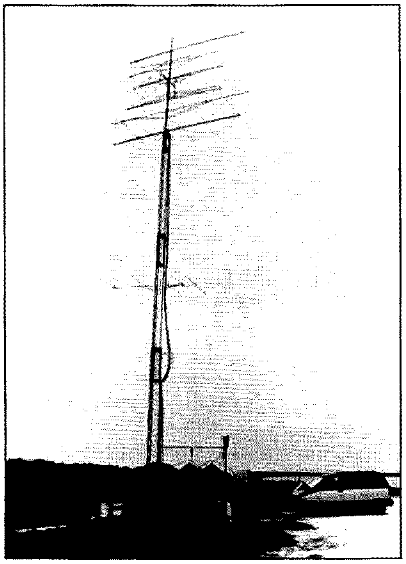


Photo C. A view of the tower trailer with Chincoteague harbor in the background.

p.m. Just what we wanted to hear! Later, the Harbor Commission chairman, Jim Thompson, stopped by to check out our tower trailer and gave us the same weather report.

A few squawks from the IC-290 in Ivars' van revealed Rich cruising over the Chesapeake Bay Bridge Tunnel—nearly 70 miles away! He was racing the thunderheads north while trying to work 2-meter SSB and check for 6-meter E-skip all at the same time.

Ivars built a tripod arrangement to hold the twin 55-element yagis for 23 cm and twin 23-element yagis for 33 cm during ground assembly. An ingenious H-frame was welded together by Mike WA2VUN to support both UHF antenna arrays. I often wonder where our successful DX trips would be without his welding ability! Using the tripod, we could put together these fragile antennas in a convenient manner as well as connect the power dividers and check the swr before plunking them on top of the tower.

The work went on even when the stiff southwesterly breeze turned into quite a gale and brought dark clouds with the rumbling of thunder. In this weather it took almost an hour to assemble the tents. We really began to hustle; the trailer was cleared, all of the rigs laid on the ground, and the grill fired up. Soon the rain was coming down in sheets, accompanied by spectacular lightning displays, including numerous hits on NASA's Wallops Island test site across the inlet. We huddled in the cars through the worst of it and came out to find the tents full of water. Several cardboard containers holding equipment were completely soaked. Luckily, none of the equipment suffered any damage. Even the ICOM mast-mounted preamps wound up being partially submerged, but still worked fine after a dry-out period.

About 10:30 p.m. the drizzle stopped. What better time to start loading up the tower trailer? Rich WB2OTK had arrived just before the rain and, after a quick dinner, was ready to climb the tower. We fired up the generator, connected two drop lites, and managed to string up a total of 8 yagis on the mast. By midnight, all of the antennas except 6 meters were in place with the tower cranked over and supported by the ladder, and we stumbled off to our soggy sleeping bags for the night. One thing you learn on a contest site is to work whenever the weather allows it—not when you feel like it!

The Big Day

Saturday started out better, with the skies cloudy but bright. Soaked equipment was put out to dry, and a crew set about finishing the coaxial feedlines while another crew began hooking up all of the equipment. In spite of all our efforts, virtually all of the type-N connectors had soaked up water and a lot of sand and had to be blown dry. One scary moment occurred while Steve was cranking the tower up; the handle came off in his hand and the three sections collapsed like a runaway elevator with a resounding SLAM!! Believe it or not, the only damage was a bent reflector element on the KLM 7LD 6-meter yagi and we straightened this out with a makeshift pole.

One by one, the stations came on the air. First, we set up the 6 meters with the 740/MMT 50 combination driving a 4CX250 Gonset. Ivars had added ARR GaAsFET preamps to both of our MMT50 units to "soup-up" the front end, and, boy, did it make a difference! Es was coming in and out, with signals from Florida as high as S9+60 dB at times. 2 meters was next, using the IC-275A with an MML200-S power amplifier. The 275A front end really does a good job, but with the MML's preamp it worked all that much harder, except on really strong signals, when the 275A went into compression and the preamp was shut off.

Our 220 station was equally strong—an IC-740 driving one of the new MMT 220-28S transverters with 3SK60 front end. With a Mirage C1012 amplifier, we saw 130 watts out to the 220 Boomer, mounted at nearly 70 feet—right at the top of the mast. The IC-475A went in place quickly, and a Tokyo High Power amplifier provided about 110 watts output, as well as a GaAsFET on receive. Steve took care of 903 and we saw about 20 watts output when everything was connected.

With all this safely in hand, it fell to me to interface the IC-1271A, AG1200 and my homebrew 3CX100 amplifier. This took some doing, since the only good relay I could use for "bypass"-type switching failed after we got there! We wound up jury-rigging two Dow Key 77 BNC relays to make the connection, at the cost of additional swr through those relays, but what can you do at 1:00 p.m. when the contest starts in an hour? Nevertheless, it all worked, and we got over 50 watts from the amplifier to drive the 110 elements.

And They're Off!

Two o'clock came too quickly and WB2WIK/4 was on the air for better or worse! Throughout the morning, we had been dodging the bullet of inclement weather,

but the clouds had a silver lining: Lots of Sporadic E on six meters! In fact, about 2 hours into the contest, the band opened to Florida and midwest, staying open through just about the whole contest. It was heaven! I couldn't pull the dupe sheets out of the computer fast enough to keep up with Rich and Ivars.

Two meters wasn't so bad either. We certainly had a crowd waiting for us, and three log pages filled rapidly as the long awaited "Roger, QSL, please copy Fox Mike Two Seven" went out over the air. Some operators were obviously so wound up that they tried to work us two or three times after that—the old DX fever. Rich and Ivars soon went into severe Es shock; their eyes turn red, arm and head motions became mechanical, and all questions (including what they wanted for dinner) were answered with "Roger! 59! FM27!" Logger's wrist soon set in. The pages were filling up so fast that they were using the margins, grid maps, Kleenex, and the tabletop. I even had one call logged on my arm when I leaned on the table to check the 6-meter swr.

By 8 p.m., 6 hours into the festivities, we had accumulated 177 contacts and 100 grid squares on 6 meters. Think of it–VUCC in 6 hours, averaging almost 30 contacts per hour! Two meters was hard-pressed to keep up with that kind of Q rate, turning in only 80 contacts and 28 grids for the same interval. Two things conspired against the 144-MHz station: (1) virtually every single op I knew about was on 6 for the E-skip; and (2) a spirited battle for the rotor control box was underway between the westward advocates on 6 and the northward advocates on 2 and above. Fortunately, the latter group won out on rare occasions.

The UHF activity hours began at 8 p.m. and ran through 1296 by 11 p.m.. After prying Rich loose from the HAM-M box with a crowbar, we set about giving out FM27 on 220, 432, 902 and 1296 to a very enthusiastic crowd. By midnight, we'd bagged 19 contacts and 16 grids on 220, 30 contacts and 17 grids on 432, 2 contacts and 2 grids on 903 (better than nothing!), and 8 contacts in 6 grids on 1296. Most of these were with multi-op stations, as the single-operator types chose to milk every last QSO out of six meters. We were getting out impressively, working into Vermont, upstate New York, North Carolina, Virginia, Tennessee and New England on the microwaves.

Shortly after midnight, another severe storm blew in, making our decision to shut down for a few hours a very easy one. Coaxial feedlines were tossed out of the shack. (With all of those GaAsFETs, why make an easy target for the lightning?) Our "lightning rod" was cranked down about 20 feet for the night. Steve and I had smartly closed the vents to prevent rain from coming into the tent, but the downpour was so severe the front flooded out and water came in through the bottom, soaking the sleeping bags and the rest of the computer paper for duping.

After sleeping fitfully through the drizzle and a few more cloudbursts, we woke around 6:30 and decided to try some tropo contacts. We bagged a few more grids on 220 and a handful of contacts, including some grids in New England that were sorely needed. 432 yielded another 30 QSOs by noon with 5 new grids, and 903 came to life with 4 more stations in 3 grids. The latter featured contacts to W2SZ/1 in FN32 (over 400 miles) and W3CCX/8 in FM08 (over 250 miles).

1296 brought a few more Qs and added 3 new grids, but the activity just didn't seem to be there for some reason. Could it be that ol' 6-meter E-skip again? Yep, there was Rich, glued to the IC-740, working into the southwest, midwest, and even the Pacific coast, with the rotor aimed west. We had installed that second 6-meter beam at about the 30-foot level, aimed west, but the angle seemed to vary so much for prime Es that the 7-element beam kept coming into play while stations were worked in the 5th, 6th, and 7th call areas.

By noontime we had accumulated 260 contacts and 132 grids on 6, not to mention a tremendous case of indigestion from all of the junk food we were eating and even greater numbers of green-head horsefly bites. We tried every type of repellent, from OFF™ to Cutters™ to AVON™ Skin So Soft, which worked the best. About mid-afternoon, the skip on six was so short (Ohio, North Carolina) that we looked for an opening on 2 meters. Bingo! South Texas and New Orleans were bagged in short order, and two meters was also off and running. We had a problem

here with the desensing of the 2-meter station by the 6-meter equipment, a problem that inexplicably reversed itself for the last four hours of the contest.

About 6 p.m., Steve and I decided to get some fresh shrimp, corn, and more beer for dinner. Of course, the instant we left, the antenna relay began to fail on the 6-meter amplifier, with reports stating "...Your audio sounds horrible! I can't understand you, but don't go off the air! I need the grid square!" Figure that one out! We did, in fact, have to shut down because the DPST Dow Key relay totally failed, and the station had to be rewired with an SPDT relay and the appropriate bias switching, etc.

Rich was a man possessed at this point, for I made the mistake of informing him that we had accumulated 300 QSO's and 150 grids. I compounded the error by stating that I didn't think we could reach 200 grid squares in the time remaining. Well, you don't say things like that to a 6-meter maven! The rotor control box fights started all over again, with Steve and myself trying to swing it north for the UHF activity hours and Ivars and Rich holding it west while they flushed out grids like ruffed grouse.

Our strategy on 220, 432, 902 and 1296 was simple: All 902 and 1296 work would be according to schedules. On the other bands we called CQ along with such incentives as "Last chance to work FM27 until next year!" and "Offer expires at 11 o'clock tonight!" It worked! There was a rush on 220 and 432 to make those last contacts, resulting in 6 more QSOs and 1 grid on 220, and 20 more QSOs with 4 grids on 432. 902 coughed up 2 more QSOs and 2 grids, and a turn on 23 cm brought in 5 QSOs and a new grid (calling CQ on 1296.110, incidentally).

By now two meters was blowing away the front end on 6, so both operators tried to synchronize CQs for the remaining two hours, which was pretty hilarious. But they did it! Rich finally broke the magic 200 grid square barrier at 10:21 p.m. with 39 minutes left, and went on to add four more by the time 11 p.m. rolled around. He was frantically calling KH6IAA as the final gun sounded. We managed to pull a few more out on 2 as well, finishing with 38 grid squares there.

The Final Tally

After cleaning the logs on my computer at 11:30 p.m., I came up with the totals shown in Fig. 1.

The "equipment contest" went pretty smoothly. Only two major failures occurred and they involved antenna relays of questionable origin. Both of the transverters worked extremely well, as did the three ICOM radios on 144, 432, and 1296. In fact, the 475A makes a pretty hot setup on 70 cm with a GaAsFET in front of it—even in the presence of strong signals. The AG1200 preamp really makes a big difference with the IC-1271A, even the way we used it, just ahead of the radio and not on the tower. All of the antennas performed nobly. The only casualty here was the bent reflector element on my 7 LD 50-MHz yagi that finally snapped on the way down. The Tonnas weathered the high winds without a scratch, although we did notice a slight misalignment of the top 55-element yagi for 1296—perhaps caused by the big "crash" before the start of the contest. They came down equally fast and were transported north in one piece, as was the 220 Boomer. This antenna really outdid itself as we worked into Ohio and Georgia with good reports.

Look for us next year, when we return to the same site with two tower trailers and some Rohn sections to allow three different stations to operate independently. No sense losing good personnel in a heated battle for the rotor control! Keep your ears open for WB2WIK/4..."Roger, roger...Fox Mike Two Seven...QSL?" ■

BAND	QSOs	GRID SQUARES
50	459	204
144	214	38
220	51	24
432	86	27
903	8	7
1296	28	13
TOTALS	846	313

Fig. 1.

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General Purpose VHF/UHF Antenna

This is a good, cheap broadband antenna that can be built in a weekend, and it's great for those who don't have a lot of space.

Winter storms wreaked havoc with my scanner antenna and I needed to find a replacement.

I was attracted to the discone. This type of antenna, when properly designed, is capable of operating over a 10 to 1 frequency range. With this range an antenna designed for low-end operation of 100 MHz is usable up to one GHz.

I was turned off by the cost of the commercial version; it cost nearly what I had paid for the scanner! So, I decided to build one myself. I did, however, avoid parts that needed special machining.

This project is simple to build and requires only basic tools and readily available materials (see Parts List). The basic antenna, along with the formulas for determining the lengths of the various elements, is shown in Figure 1. The RSGB VHF/UHF Manual was my reference. I decided that a low-end frequency of 108 MHz would be desirable, since this is the low end of the aircraft band covered by many of the new scanners. This allows maximum utilization of the brazing rods. The parts are cut, drilled, and assembled as shown in Figures 2 and 3.

The results have been encouraging—the swr on the amateur frequencies between 144 and 450 MHz is less than 2.5:1 over the entire range. When measured at the end of a 50-foot piece of coax, the swr is 1.5:1 or better. Spot-checks on various commercial frequencies gave similar results. A modified version provides adequate receive coverage on the VHF low (30–50 MHz) public service frequencies.

Construction details are as follows:

108–145 MHz

1. Cut the brazing rod to dimension A (27").
2. Prepare the brass pipe cap—drill and tap

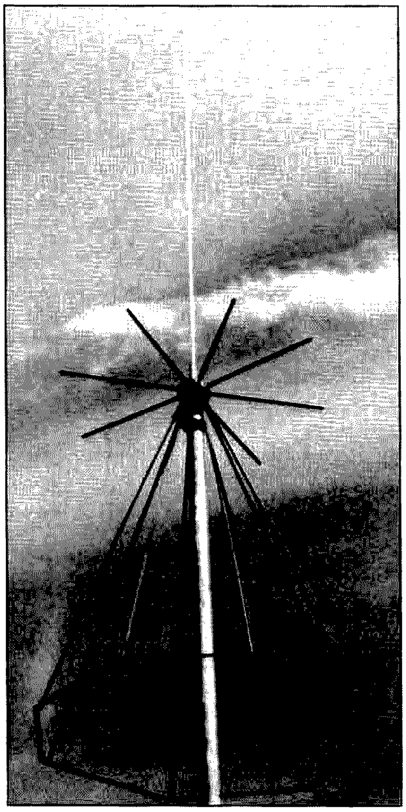

Photo A. The WA1GPO home-brew VHF/UHF discone antenna.

A Cone Element Length = 2952/F(MHz) = 27 inches.
B Disc Diameter = A x .7 = 19 inches
C Cone Diameter = as small as possible. Here is 1.25 inches.
D Space between disc and cone = .2 x C = .25 inches

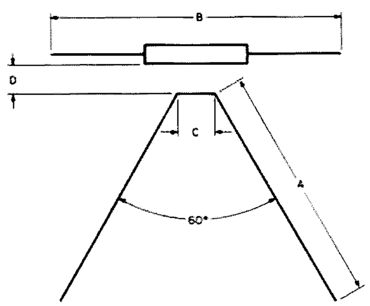

Fig. 1. Schematic diagram of the antenna and formulas for determining the lengths of the elements.

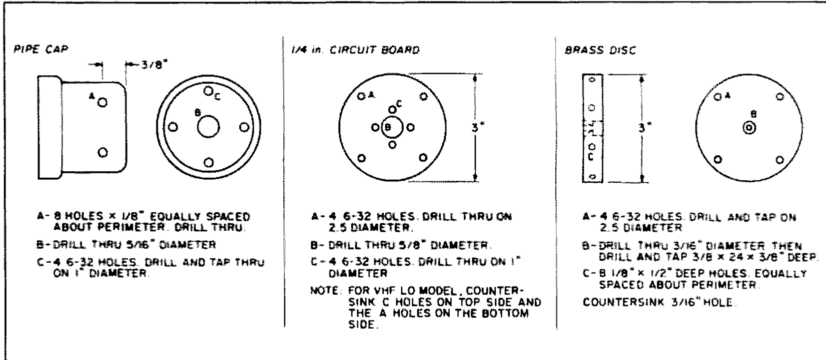

Fig. 2. Top and side views of the base assembly for the elements and vertical whip.

all holes, buff clean, and file the top of the cap flat.
3. Bend the elements to the desired 30° angle, and solder the elements on the cap.
4. Install the BNC connector in the cap.
5. Trim the circuit board to size, drill the mounting holes, and solder the remaining pieces to the brazing rod in position to form the disc, then trim the disc to a 19" diameter.
6. Attach the disc to the brass cap with nylon screws, and solder the center conducter of the BNC connector to the disc, and seal the connector hole with silicone sealer.

VHF Low and 108–450 MHz

Complete steps 1 through 4 above.
5. Trim the circuit board to size, drill and countersink all holes, mount the BNC connector on the cap, and mount the board to the brass cap with flathead s.s. screws.
6. Prepare the brass disc—drill and tap holes as required, and solder the remaining pieces of rod to the brass disc.
7. Solder a 3" piece of #18 solid wire to the BNC connector, and mount the brass disc to the circuit board using flathead s.s. screws.
8. Coil the 3" wire in the 3/8" hole, and install the modified CB whip, and trim 4" off the antenna.

The antenna can be installed using conventional pipe. In the low frequency version, the lower section of the pipe should be 84 inches long. This 84-inch section is the lower half of the sleeve dipole, and should be isolated from the mast to which it is mounted. You should select a good grade of coax to minimize the line loss; RG-59 BNC connectors fit well on RG-8X 50-Ohm cable.

Two final notes: Be careful when drilling the soft brass as it tends to "grab," and, as with any broadband antenna used for transmitting, a low-pass filter on the transmitter is recommended to minimize harmonic radiation. The photo shows the details of the discone construction. ■

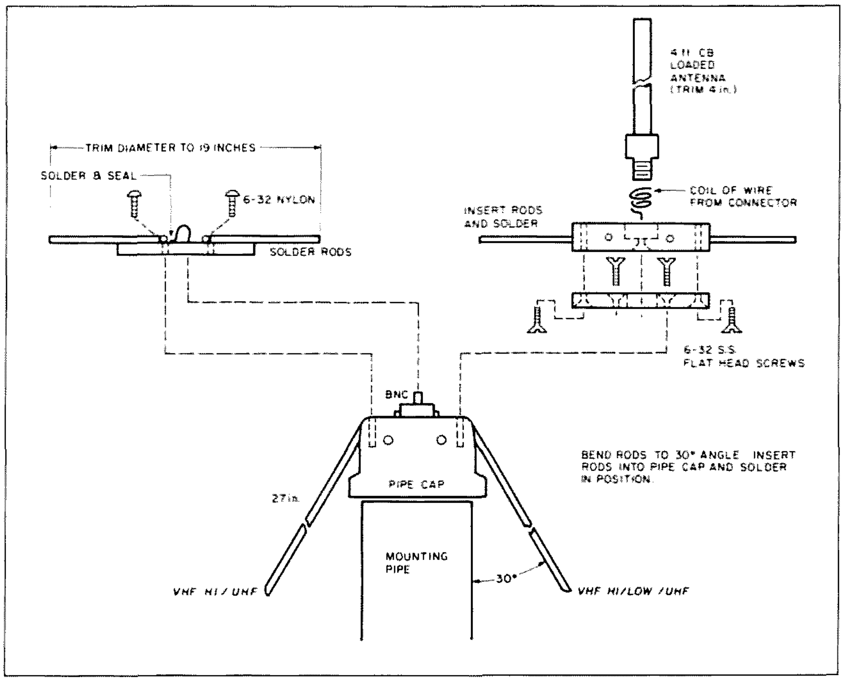

Fig. 3. Blow-up side view of the element base assembly.

Parts List

1. 1" brass pipe cap
2. BNC chassis mount connector (Radio Shack 270-105)
3. 1/4" glass epoxy circuit board, with a 3" diameter
4. 1/8" x 36" brazing rod (8 ea.)
5. 60/40 rosin-core solder
6. 6-32" x 1/2 " nylon screws (4 ea.)
7. Silicone seal

Low Frequency Version

Items 1 through 5 same as above
6. 6-32 x 1/2" stainless flathead screws (8 ea.)
7. Brass disc, 3" diameter x 1/2"
8. 4' loaded CB antenna (Radio Shack 21-934)

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The L'il Fixer

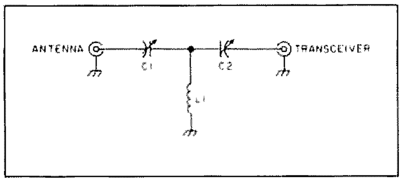
Let this tuner tame your truculent two-meter antenna!

The L'il Fixer has been in use in the Milwaukee area for the past five years and is beloved by the 2-meter, 1:1 swr aficionados. It's about time we share this boon with our fellow VHFers!

A compact little rascal that requires only two 35-pF air-variable capacitors and a four-turn coil of #20 or #22 solid copper wire (use a quarter-inch drill bit for a winding form), In fact, on my motorboat, the good ship *Layabout*, it matches an Isopole™ marine antenna (158 MHz) to a Kenwood 7950, with astonishing results. Dr. Reynold's antenna lays down a super signal when tamed by the L'il Fixer!

Build it compactly on a breadboard or plastic sheet; avoid a metal box. Note that the coil junction is off-center; by reversing the ANT and XCVR connections, you get an adjustment in inductance. Varying the coil spacing will also give some variation. Adjustable silver mica capacitors with screwdriver slots will work fine, and make for a very small unit, if the 35-pF variable caps can't be found. Any layout seems to work, but a wide ground strap between the ANT and XCVR coax fittings is a good idea.

This is really a simple project. It will give you a sense of accomplishment with a minimum of effort, and you can brag to your friends: "The swr here is one to one, OM!" ■



Schematic of the L'il Fixer

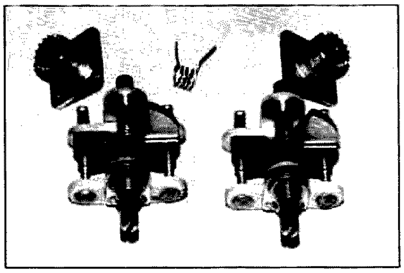


Photo A. The components for the L'il Fixer.

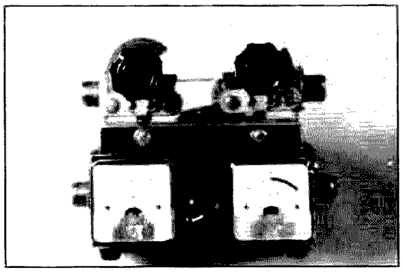
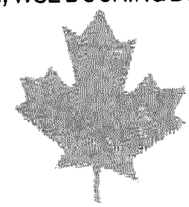


Photo B. Front view of the L'il Fixer.



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440-MHz Folded Dipole Repeater Antenna

An antenna immune to almost all weather conditions, virtually static-free, and practically maintenance-free.

Commercial price tags and the unavailability in the 440-MHz range helped to prompt the home-brew construction of this 4-bay folded dipole antenna. The only array that could be located for amateur use was a dual 8-bay version that cost around $500.

The folded dipole is one of the most widely used antennas in the VHF/UHF public safety and commercial spectrum. One of the reasons for this is that the antenna is almost immune to lightning damage; another is that it virtually eliminates the static build-up problems common to other antennas.

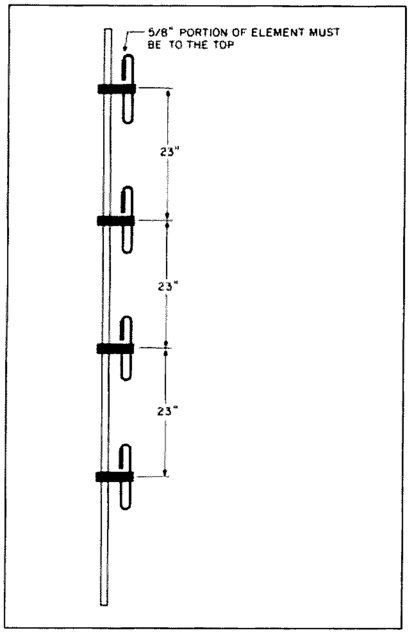

Fig. 1. Side-view diagram of the dipole mast and elements.

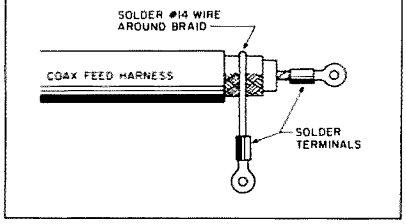

Fig. 2. Feedline attachments to the elements.

Unlike many "dc-grounded" antennas, this one ensures that both the center conducter and the shield are at true dc ground potential for each radiating element. Other antennas that may show a dc ground with an ohmmeter may use phasing coils or other matching devices between radiating sections. Inductance is introduced and the static-reducing effectiveness is diminished. Gamma-fed elements are at ground, but the center conductor is not.

Each element in this array is uniquely designed to be 50 Ohms at the operating frequency. This makes it easier to modify the array to a one-, two-, four-, or eight-element configuration. I selected the four-element one because it gives considerable gain while still exerting good vertical beamwidth for use in hilly areas. Higher-gain antennas can actually perform more poorly for mobiles and portables at close range in some instances. Gain for the 4-bay array is approximately 6 dBd omnidirectional or 9 dBd for unidirectional radiation patterns. Vertical beamwidth is 15° for the half-power points. Power levels of up to 250 Watts can be used depending on the style of phasing harness used.

Construction

Construction of the antenna elements is much easier if you have access to a machine shop, and the necessary materials can usually be purchased there. A 3/8" and 5/8" solid aluminum rod was used for the radiating material and a 1" x 1/4" solid aluminum flat bar stock was used for the element support arm. Heavy duty materials not only provide strength, but insures that the aluminum parts will not warp from the heat when they are Heliarced together. The assembly was welded to eliminate noise generation from loose parts. Alloy aluminum (6061-T6) was selected because it machines well. Prior to welding, all parts should be completely cleaned with steel wool soap pads and water. Be sure to advise the person who is doing the welding what the alloy is.

Attachment points for the feed harness are made by drilling and tapping holes to accept 6-32 machine screws. The use of stainless steel screws and lockwashers is definitely recommended.

The element support arm should be drilled

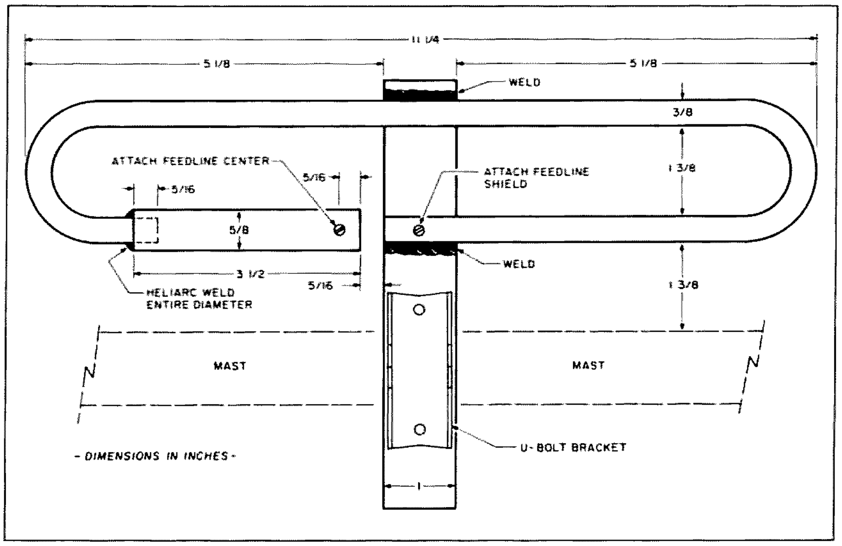

Fig. 3. Diagram of an element.

to accept an appropriate U-bolt and associated toothed bracket so that spacing is maintained (see Figure 1). This can be a little tricky because various diameter masts and U-bolts will change the spacing. Do not complete this step until the element is welded together. It is not known how critical this dimension is.

For the easiest element fabrication, the 5/8" section should be drilled in one end to accept the 3/8" material. The fit should be snug and the hole should be about 5/16" deep. This allows the 5/8" piece to slip into the open part of the element.

The builder has some options on the style of phasing harness to use. The original antenna utilized a 4-way power splitter which was put together using test equipment not normally available to most hams. Construction is not included in this article. KLM offers a similar unit which should work as well. A phasing harness can also be made with odd quarter wavelengths of 75-Ohm coax. This method is described in the *ARRL Handbook*, and in others as well. Remember that all elements must be equal lengths of 50-Ohm cable if a 4-way power divider is used. Excess cable can be attached to the mast. The divider is best positioned at the middle of the array to minimize cable lengths. It is best to use an RG-8 "flooded-braid" to help keep water from migrating up the shield. A flooding compound is put in the braid by the manufacturer to accomplish this. In any case, the ends of the cable must be weatherproofed, particularly where they attach to the elements.

Crimp-on ring terminals should be used to attach feed-line to each element. Prepare the end of the cable in the same fashion you would to attach a PL-259 connector. Use a piece of 14-guage copper wire to encircle the braid, and solder it all the way around the coax braid. Install a ring terminal to the end of the wire and put another terminal on the center conducter. Solder all terminals and position them so as to put the least amount of strain on the assembly. Weatherproof with *good* grade black vinyl electrical tape such as the Scotch 33 Plus. Stretch the tape slightly while applying, making sure to release all the tension during the last four or five windings down the cable. Additional heat-shrink tubings would not hurt, either. If you choose to use nylon cable ties to attach the feedlines to the mast, make sure that they are rated for outdoor use. Otherwise, use black vinyl tape over the each tie so that it will not deteriorate from ultraviolet light.

The array should be mounted on a mast, this then becomes part of the antenna. Masting must extend above and below the top and bottom parts of the elements by at least a few inches, at least six inches on the top if the antenna is to be top-mounted. I suggest galvanized pipe for top-mounting. If the antenna is mounted on the side of a tower, a piece of electrical conduit can be used and bent with offsets at each end to allow for top and bottom attachment to the tower leg. Spacing between mast and tower is 1/4 wavelength.

Spacing between the elements is 23" center-to-center. When attaching the element to the mast, the mast should be on the same side of the support arm as the element rod material. Make sure that all the elements have the 5/8" diameter part at the top. In tower side-mounting, the elements align one over the other, and face away from the tower. Top-mounted installations for omnidirectional coverage should have the elements arranged around the mast in 90° increments. I don't recommend this configuration.

Comments

Vswr across the band should be 1.5:1 or less. The bandwidth is at least 20 MHz wide.

In constructing the elements you should use the exact dimensions shown in Figure 3, since any deviation may produce an undesired effect. Most of the engineering in this project was trial and error rather than design.

The prototype was placed in service in the summer of 1986 and has performed beyond expectations, and the winter weather conditions at the site are harsh, often with seventy mile/hr winds and snowdrifts of up to 15 feet. Still, I expect several maintenance-free years out of it.

Thanks go to the following people who provided construction assistance: Phil Hiller WA2EQX for masting and installation; Jon Henning WA2BTW for the power divider and for providing test results; and Dan Wood and Dave Nelson for prepping and welding the antenna. ■

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The HF Half-Sloper

Here's an inexpensive, compact, and easy to build antenna that's great for DX

Here's an antenna that will cover 160, 80, and 40 meters. It's inexpensive, easy to construct, and will fit on a small city lot. It's also great for DX. It's called a Half-Sloper.

The Half-Sloper (or quarter-wave sloper) has a low angle of radiation and exhibits some directivity in the direction of the slope. The antenna's polarization is vertical. By using the loaded coils described below, a 3-band sloper can be constructed to fit into less than 60 feet of yard space.

The 3-band sloper described was built by my fellow club member, Joe Gabor WA8WEQ. Joe is retired and has built a dozen or so of these antennas for members of the Steubenville-Weirton Amateur Radio Club. (Don't you wish you had him in your club!)

Materials

The antenna is constructed of #14 stranded, insulated wire. The loading coils are made with #16 enameled magnet wire on 1 1/2-inch I.D. diameter, schedule 40 plastic pipe. Scrap pieces of 1/4-inch-thick acrylic are used for the insulators inside the coils. You can buy these items in most hardware or electrical-supply stores.

Building the Half-Sloper

First, make the loading coils by winding the #16 stranded, insulated magnet wire. Next, fasten the end of the antenna wire coming from the tower to one end of a piece of acrylic that has been cut to fit inside the 80-meter coil. Take the other end of this piece of acrylic and put it through the coil; then fasten it to the beginning end of the 13-foot 11-inch length of antenna. Solder jumper wires from each end of the coil to the antenna (Figure 1).

Now, fasten 13-foot, 11-inch piece of antenna to the next coil (the 160-meter coil) in the same way, and then fasten last length of antenna to the other end of the 160-meter coil. Make this last piece of antenna a few feet longer than the 6-foot, 5-inch length needed so you have wire to play with when you're adjusting the antenna. Solder jumpers to the coil ends as before.

A piece of scrap aluminum or other metal can be used to fabricate a clamp that can be fastened to the tower leg to hold the antenna and the SO-239 to which the RG-58 feedline is attached. There will be a jumper from the center of the SO-239 to the antenna, of course.

Operation

Having a sloper makes for some lively discussions on the ham bands. Some swear by them; others wouldn't own one. But it's a great antenna to experiment with.

My sloper angles down from a 30-foot tower (Figure 2) on which are mounted a 4-element tribander and an 11-element, two-meter beam. I also have a 160-meter dipole that is only 35 feet at the apex.

While writing this article, I disconnected the sloper from the antenna tuner and con nected it directly to my Yaesu 757 to check the swr. I got 1.3 on 1925 kHz, 1.5 on 3860 kHz, and 1.1 on 7150 kHz. The swr changed rather rapidly as I changed frequency on 160 and 80 meters, but remained almost flat over the entire 40-meter band. I felt these results were to be expected with this length antenna. Received signals, especially in the direction of the slope, the favored direction, were as good as and often better than they were with my dipole.

All installations are different. Your results could be totally different from mine. Variations in height, grounding, and surrounding objects certainly affect antenna performance. But try it! Experimenting with antennas is part of the fun! ■

Photo. Joe Plesich holding a finished loading coil.

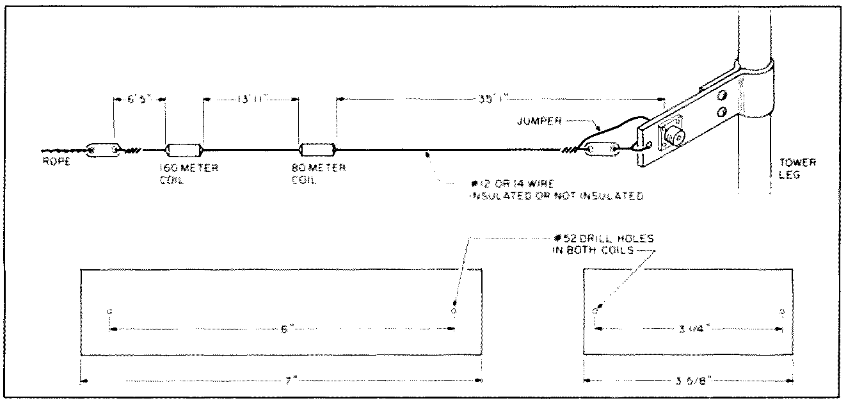

Figure 1. Diagram of the half-sloper showing details of the assembly and coils.

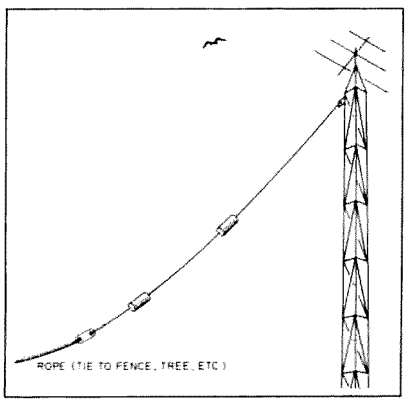

Figure 2. Half-sloper in position on tower.

WEATHERSAT

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DIGITAL SCAN CONVERSION

I have lost track of the number of times I have been asked about the "best" image display system for satellites. These days the answer boils down to two distinct alternatives, each of which has advantages and disadvantages. The "hot" item these days is digital scan conversion. Be they dedicated units or computer assisted, scan converters have a lot going for them. First, they are easily set up as multi-mode systems. The *Weather Satellite Handbook (WSH)** scan converter, for example, will handle fully automatic display of GOES and METEOSAT WEFAX images as well as TIROS/NOAA APT, 240 LPM COSMOS, and 120 LPM METEOR transmissions. You can look at as many pictures as you want with no up-front costs for paper or other supplies. Given the expanded memories available for today's microcomputers, it is even possible to store a satellite image at essentially full resolution. The *WSH* scan converter, when used with the 512K Color Computer 3 for example, stores 768 image lines with 1024 pixels/line. Although the display is limited to 256 x 256, you can display the entire picture at the display resolution or use the display as a "window" to move into any selected subset of the image for viewing at progressively higher resolution. Back in May, I showed you some examples of this type of display.

The real problem with scan converters doesn't arise until you want a permanent copy of a particular picture. Any approach to hardcopy, be it photography or video printers, shares the basic limitations of the display system. If you want the entire picture, it will be limited to display resolution. Yes, you can zoom into selected areas at higher resolution but you will never see the *entire* picture at that resolution. In short, scan converters are the ideal way to look at pictures, but not the best approach to printing them.

FAX machines, in contrast, are ideal for printing an image at full resolution but not without a price. The mechanical nature of FAX means that a specific machine may be able to handle some modes but not all the possibilities you may be interested in. The FAX system described in the *WSH* does a fine job with WEFAX and 240 LPM COSMOS imagery but requires another stylus drive motor (or a dual speed motor) for line-blanked NOAA APT display. It will not handle 120 LPM METEOR or side-by-side visible and IR NOAA display without a different drum motor, and if you build it with that motor, you can forget the 240 LPM modes, such as WEFAX! Most commercial FAX systems will not work directly with any satellite mode, either because of their line rate, index of cooperation, or modulation format (or all three!). The Alden *Weatherchart* recorder, which will be reviewed here in *73*, is a good example of a rugged, well-engineered FAX machine that will not handle any satellite mode without extensive modification.

Even a satellite-compatible FAX machine presents a few problems. FAX paper costs money and you must print a picture just to see what it is. FAX machines will end up costing you quite a bit of money to operate if you want to look at a lot of pictures, many of which are rejected. Most FAX machines work best in real time, so you get one shot at a specific image. Even those systems that are tape-compatible will rarely yield results on a replay that are equivalent to "live" copy. In short, FAX machines print up a storm, but are not too good for simple "looking" or for multiple copies.

The SMARTFAX Concept

SMARTFAX is simple in concept—it combines the advantages of digital scan converters and FAX recorders, eliminating disadvantages of each! Let's assume a scan converter like the 512K *WSH* system, where the computer is actually holding in memory an image at something approaching full resolution. When we use the term "scan conversion", we usually think in terms of how the computer will handle the data for TV display, but the scan conversion process is universal in the sense that the image data in memory can be outputted in almost any other format as well, including one acceptable to a specific FAX system. Other than specific hardware and software considerations, the FAX format is immaterial—it can involve almost any line rate, index of cooperation, or video format. In effect, we use the TV end of the scan conversion process to *look* at pictures, basically for free, while we use the FAX output option to print pictures of particular interest. This approach to using the power of the computer has the potential to completely alter the way we handle and archive our image data. Basically *any* FAX machine can be used to print our images, for the original data format doesn't matter. We need print only the pictures that we want, since we can preview them in any detail using the TV output function of our scan converter. Copies of each picture can also be printed, which will be identical in quality with the original, for the computer is functioning as a digital recording system. As I will show later, if you want to build a FAX printer, the resulting project is far simpler than a standard FAX recorder with the added bonus that it will handle any image format compatible with the basic scan converter. In the following sections, I will outline some of the principle hardware and software considerations that can make SMARTFAX work with any computer, after which I will describe an ultra-simple SMARTFAX recorder which you can put to work with the *WSH* scan converter using readily available software.

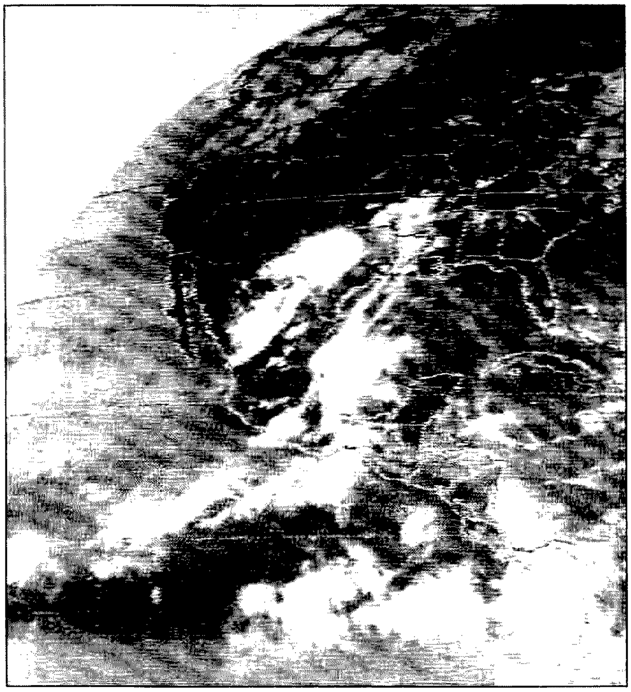

Figure 1. GOES E IR quad, transmitted through the GOES C spacecraft. The image was acquired live using the WSH scan converter and a 512K CoCo 3. This particular print was made directly from the high-resolution image in the computer memory (380K of image data) and printed to the simplified SMARTFAX recorder to be described next month.

Image Outputting

No matter how we are going to use the video data from the computer, we must first perform a D/A (digital-to-analog) conversion since any FAX system requires some sort of analog signal for operation. In the case of the WSH scan converter, we are in luck, for the CoCo has a D/A converter available in the form of the cassette audio output port, so no additional hardware is required in a great many applications. If you are not lucky enough to have a CoCo, you will require a latched output port with enough bits available for your video (anywhere between 4 and 8 with most systems). Commercial D/A converter chips can be used to convert the latched port data to analog form, or you can simply use an op amp as a summing amplifier.

Baseband Video

In most FAX systems, there is a point in the circuit where, regardless of the modulation format, the signal has been converted to a variable voltage to drive the printing output. Typically, some specific voltage will represent black, and another voltage will be the white limit. With suitable gain and offset adjustment, your analog video output from the computer can provide the needed drive, completely bypassing the video processing circuits of the FAX recorder. In the case of the SMARTFAX video circuit, we will use the CoCo cassette output directly, with no additional hardware. For other FAX systems, op amps may be required to provide the specific signal levels, voltage offsets, etc.

Subcarrier Modulation

If you want to output to an existing FAX machine that requires either FM or AM video, some additional hardware will be required. For FM video (1500 Hz black to 2300 Hz white) I would suggest an FM modulator circuit (see Abrams, C. and R.E. Taggart. 1984. Color Computer SSTV, Part 1. *73 Magazine*, November, pp. 10-21). If you need AM video, use the AM modulator circuit from the WEFAX test generator shown on page 7-2 of the *WSH*. Leave out U5-U14 and apply video to pin 2 of U15. Use an op amp for gain and offset adjustment so your applied video ranges from 0.2V black to 5V white, and you will be in business. Baseband video is easier, but the point is, you can make the FAX machine "see" any kind of format you want!

Output Timing

Assuming you can output your memory data in the desired format, you must also clock it out at just the right speed for the line rate of the target FAX system. Timing loops for the FAX output function are usually too hard to get precisely right and, if output timing is off, the image that is printed will have a distinct slant, if it is visible at all! The best results are achieved by using a crystal-derived clock frequency, either from an external clock circuit or from a programmable timer, if your computer has one. To keep things simple, the clock frequency can be chosen so that you latch a pixel at the output with each HIGH transition of the clock. The required clock frequency (C) in Hz is then a function of the number of pixels per line (P) and the target FAX recorder line rate (LPM):

$$C = (P \times LPM)/60$$

If we wanted to dump a WSH scan converter image (1024 pixels/line) to a 120 LPM FAX machine for example, the required frequency for the "dump" clock would be:

$$C = (1024 \times 120)/60 = 2048 \text{ Hz}$$

The WSH scan converter already has a clock at this frequency which is used to time pixel loading of image data. If we wanted to dump to a 240 LPM system, the simple clock approach would suggest a frequency of 4096 Hz, but we could accomplish the same dump using the available 2048 Hz clock by dumping a pixel to the output when the clock goes HIGH and then dumping a second when the clock goes LOW! A computer can have similar flexibility when dealing with other dump options.

One final output timing question has to be considered. Given that the computer memory contains a certain number of lines for the image in question, how many times must each line be dumped in order to obtain a FAX print of approximately the correct aspect ratio? In order to answer this question, we need to know several things: the width of the FAX printout in inches (W), the number of lines in the video memory (L), and the number of lines per inch (LPI) printed by your particular FAX machine. You should already know L (768 for the *WSH* system) and W can be determined by simple measurement in the case of a home-brew system, or from the manual in the case of a commercial system. The LPI factor is a bit more tricky. If you have a commercial recorder, the manual will usually give either the LPI and/or the index of cooperation (IOC). If need be, LPI can be calculated from IOC where:

$$LPI = (3.1416 \times IOC)/W$$

If your target machine has an IOC of 576 and an active printing width of 10 inches, LPI is equal to:

$$LPI = (3.1416 \times 576)/10 = 181$$

If you are using on your home-brew FAX a drum-type recorder with the stylus driven by a threaded rod, you can calculate the LPI value if you know the threads/inch (TPI) of the drive rod, the rpm of the drive rod motor (SM), and the rpm of the drum motor (DM):

$$LPI = DM/(SM/TPI)$$

The SMARTFAX recorder, like the WSH design from which it was derived, has a 20 TPI drive rod, a 40 rpm drive rod motor (SM), and a 240 rpm drum motor (DM):

$$LPI = 240/(40/20) = 120$$

Assuming we can figure LPI in one fashion or another, the number of times each line in memory has to be dumped to the output (N) to achieve the proper aspect ratio with a printout with a width of W, is:

$$N = W/(L/LPI)$$

In the case of the SMARTFAX recorder, where W is approximately 7 inches, LPI is 120, and the number of image lines is 768, each line would have to be repeated:

$$N = 7/(768/120) = 1.09$$

We are obviously not going to print fractional image lines so in this case, an acceptable picture would require that we dump each line only once. In the case of the Alden *Weatherchart* recorder, the LPI value is 196 and the printing width is about 10 inches. If we wanted to print the 768 image lines from the *WSH* scan converter, each line would have to be repeated:

$$N = 10/(768/196) = 2.55$$

or, in this case, either 2 or 3 times. Obviously, by using some basic information about the format of the target FAX machine and some simple math, virtually any image in the computer memory can be dumped to any FAX system.

Control Signals

Commercial or home-brew recorders designed to handle standard FAX formats require certain control signals if they are to use all their operating functions, and at least some of these signals have to be created by the computer simulation of a FAX signal. The most important of these is the image-phasing interval that precedes picture transmission. Systems designed for WEFAX service expect each image to be preceded by a 20-second phase interval in which the start of each line is marked by a black phasing pulse

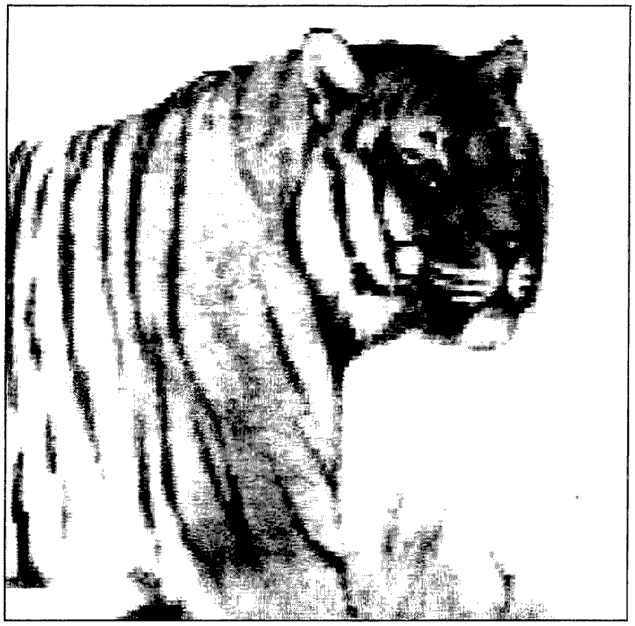

Figure 2. A 128-line SSTV image, transferred from a Robot 450C to a 64K CoCo 2 computer. The computer was used to format the image for 240-LPM FAX output, so it could be printed on the SMARTFAX recorder. This kind of trick emphasizes that the original image format is completely irrelevent—almost any grayscale or graphics image in a computer memory can be printed on a FAX machine with results that are far superior to dot matrix or video printers.

between 10 and 15 mS long, with the rest of each line being white. Since the image line is 250 mS long, the black phase pulse should be somewhere between 4% and 6% of the line length. If we assume, for the sake of discussion, that our system will be using a 2048-Hz clock frequency, each line of FAX video represents 512 clock pulses, and our phase pulse should therefore be somewhere between 20 and 30 clock pulses in duration—let's call it 25. A 20-second phase interval represents 80 lines at 240 LPM, so the pseudocode for generating the phasing signal would be as follows:

(1) Load a register with 80 (the line count)
(2) Set the video output to black (phase pulse)
(3) Count 25 clock pulses (duration of the phase pulse)
(4) Set the video to white (rest of line)
(5) Count 487 clock pulses (512-25)
(6) Decrement the line count register
(7) If not 0, return to (2), otherwise begin the dump on the next clock pulse.

Except for a few pesky details, phase interval generation for a typical 120 LPM FAX recorder, such as the *Weatherchart* recorder, is similar. The differences relate to the fact that the weather map FAX systems expect a white pulse and a black line and that the line and phase pulse lengths are twice those needed for a 240 LPM system.

"SMARTFAX is simple in concept—it combines the advantages of digital scan converters and FAX recorders, eliminating disadvantages of each!"

The only remaining control signals that might be needed are start and stop tones. Most systems expect a start tone consisting of 300-Hz square wave modulation between black and white limits for about 5 seconds. Stop tones are similar, except that 450 Hz is used and the duration is about 3 seconds. It is generally best to avoid these whenever possible, since they involve extra hardware to generate with most computers. The *WSH* FAX recorder is started and stopped manually so the tones are not required. Continuous feed systems, such as the Alden unit, can be started and phased manually, since the position of the white phase pulse is easily seen as the paper feeds out, therefore, tones are not necessary here, either. If needed, I would set up a dual 555 timer chip in an astable oscillator configuration with one side tuned to 300 Hz and the other to 450 Hz. Each tone would be routed to a bit on an input port and the appropriate tone could be generated by watching the start and stop clocks respectively, cycling the video from white to black as the clock went from high to low and vice versa. The proper time duration can be determined from the clocks themselves. Five seconds of 300 Hz is 1500 clock cycles while three seconds of 450 Hz is 1350 cycles of the clock.

That about covers some of the major theoretical points for dumping image data from a computer memory to a FAX recorder. Next month, I will describe the SMARTFAX recorder, a very simple approach to printing full-resolution images from the *WSH* scan converter memory.

Pictures of the Month

These are a couple of teasers to give you a notion of why I go through all this discussion. Both were printed on the SMARTFAX recorder, operating at 240 LPM. Fig. 1 is a basic WEFAX quad. Nothing special about this, except that it was *not* printed live. It was printed on demand from the CoCo, and I could have continued to make identical copies. I included Fig. 2 to show how powerful a concept SMARTFAX really is. This little gem is a 128-line SSTV image which my CoCo grabbed, formatted it as a 240 LPM FAX signal and shot it out to the SMARTFAX recorder. Getting interested? Tune in again next month! ■

*Note: The **Weather Satellite Handbook**, 3rd Edition is available from the author for $12.50 plus $1.00 shipping and handling (U.S.; $2.00 elsewhere).

ABOVE AND BEYOND

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QRP FROM MOUNTAINTOPS

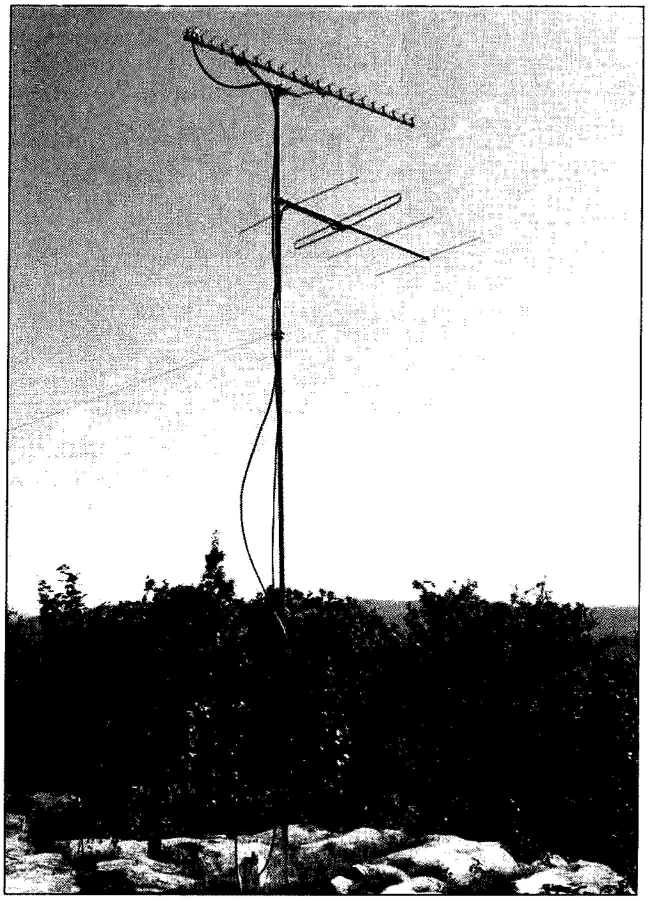
As the summer contest season draws to a close, I'd like to talk about a few portable antenna and feedline schemes I've used over the past few years to operate QRP from mountaintops. The object has always been to get the greatest gain for the least weight. In many cases, a little gain was sacrificed in favor of a lighter load.

My most popular band has been 2 meters, and I feel I've found the ideal portable antenna in the Tonna 9-element yagi (see *73,* July 1987). It's light; it breaks down very quickly; and it's made of sturdy square boom material. I've also used a KLM 4-element yagi for many years. These KLM antennas were made available with insulated through-the-boom mounts that would stay in place by themselves temporarily. For longer periods of time, KLM recommended using steel "keeper" washers fitted over the plastic insulator to snug it up to the boom.

However, I never used the keepers. I marked each of the three detachable elements with a different color and marked the boom with a corresponding color to allow for rapid, on-site assembly. A pair of these and a two-way power divider (or 75-Ohm phasing harness) take up very little room and weigh under six pounds. Each 4-element is rated at about 7–8 dB gain, so a pair will yield over 10 dB, increasing the 10-Watt signal to 100 Watts erp. The Tonna has over 10 dB to begin with—perhaps closer to 12–13 dB—and will kick your 10 Watts up close to 200 Watts erp, a very respectable mountaintop signal.

On 6 meters it's a different story. I've used the Tonna 5-element yagi, which is very light and yields about 8–9 dB gain. However, I find the pattern a bit broad. Another problem is that most of the time I use only 15 feet of masting and this doesn't quite get the antenna up a full wavelength, so the pattern is even more distorted and becomes broader still with a worsening of the front-to-back ratio. There are no easy solutions. My favorite 6-meter antenna (the KLM 50-7LD) has too long a boom to use with 15 feet of mast, so for now I'll have to get by with the 5 elements.

220 is a bit easier. The 7-element KLM works pretty well and doesn't take up a lot of room. Another good choice is the Cushcraft A-22011, which has 11 elements on only 8 feet of boom—a piece of cake to carry along. Of course, if you are handy bring some stiff wire, a bamboo or similar pole, and make a quagi (full-wave, loop-driven element) with about 6 or 7 elements. It would break down very nicely, and if it got damaged—so what?



A few sections of 20-gauge steel mast with 1296 and 144 MHz—very light with reasonable gain for their size.

432 is easier still. I've used the Tonna 21-element yagis (old style) where a clip holds the element through the boom. They were light, all right, but the element ends had a tendency to "stick" you in the kidneys when strapped to your back. Now I find that Tonna has gone to an element mount similar to their 2-meter beams, where the rod is secured to the top of the boom with a molded plastic insulator. All I need to do is rotate the insulator 90 degrees and the elements line up next to the boom—a very compact setup indeed.

On 902 and 1296 I've also used the Tonna yagis, but the plastic standoffs that hold the stiff wire pieces are not terribly strong, so I suggest a loop yagi that travels a whole lot better. If the loop gets slightly bent, just round it out. The width of the strap used in the loop adds extra strength, especially if you whack it against a tree or rock—or even if you drop it. If you want to give them a try, the Tonnas do provide about 16–17 dB gain for just 23 or so elements on a very compact boom. The feed used on 432, 903, and 1296 is a folded dipole, so no matching is needed. Keeps things simple!

It's a good idea to make a harness to secure all of the antennas together, especially those that break into sections. A simple frame can be made from 1 x 3 firring strips with small eye hooks attached for shock cords. The antennas are broken down and laid flat on the frame and strapped to it in a way that avoids element breakage from sudden impacts. This frame can be fitted with straps and secured to a backpack or the roof of a vehicle. Keeping the element ends tight against the surface eliminates the chance of damage to you and the yagis.

How about coax? I've experimented with many types, and pretty much use the RG-8/X "Mini-8" cable for short runs up to and including 432 MHz. Surprised? You shouldn't be. A piece 25 feet long with type N connectors shows only about 2-dB loss. When used with a 14-dB yagi the system gain is 13 dB, with a 10-Watt exciter that's still 200 Watts erp with a lot less weight. On receive you might want to use a mast-mounted preamp, but I haven't found that 2-dB loss hurt me significantly (except on signals 2 dB out of the noise!)

I've even used very short runs of this stuff on 903 and 1296, but the losses start to pile up, so instead I use 30-foot pieces of Belden 9913. On 1296, that means about 1.5–2-dB loss—tolerable, considering the weight involved. 9913 is heavy! Don't let that air dielectric fool you, the center conductor is a solid #9 wire. I prefer to coil this into about a 2-foot diameter circle and strap it across the points on my backpack to avoid shifting of weight.

It goes without saying to use N connectors at 432 and above. UHF types don't cut the mustard. Why bother with the extra weight of transitions? Here's another tip—when I prepare feedlines, I assume that everything will get soaking wet at some point, and use heat-shrink tubing behind the threaded barrel to make a watertight (and twist-proof) connection. You can do this easily with 9913 and 1/2" tubing. It's also quite simple with RG-8/X and two pieces of tubing—one on the cable butted against the connector, and one on the rear of the connector itself. Color code them to make the job easier on site.

Remember to bring at least one or more feedlines than you have stations. For my trip up Cathead Mountain in September 1986, I brought feedlines for three bands plus one extra piece of RG-8/X and one extra run of 9913 (didn't need 'em, fortunately!). Now, if you've planned well, you're look-

ing at about 20 to 25 pounds of antennas and cable for 4 to 5 bands.

Masting is easy. Use the lightest, cheapest "junk" swaged mast you can get from Radio Shack or a similar store. After all, how long does it have to last? I had an 8-inch-diameter plate made with four holes for stakes and a 4-inch-high collar that the mast fits into. Secure the plate to the ground using a slip ring with 1/8-inch nylon rope and additional stakes. With 15 feet of mast, you can accommodate 4 yagis quite easily, and you'll be surprised at how much wind this array can withstand.

For me, the total weight of such a package—including the radios and a power source—is between 40 and 50 pounds. (I carry the mast separately and use it as a hiking stick!) For regular hikers, that is a bit of weight but it shouldn't be too bad on leisurely trips (say up to 2 miles or so). If you've got a friend along, spread the weight around. 20–25 pounds isn't bad at all! If you're trying a mountaintop for the first time, limit yourself to one or two bands and cut the weight accordingly. Be ingenious! I often use a 220-MHz, hand-held for contacts during contests, since most multi-ops listen on 223.50 and can hear your little rubber ducky many miles away. Not much weight there!

Mini-Review—The Cushcraft 220B Boomer

I mentioned the Cushcraft 220B Boomer in the article on the Chincoteague trip in this issue. This antenna very closely models the time-proven, 32-19 2-meter Boomer design and assembles in much the same way. A T-match is used and the factory-suggested setting yields an swr of better than 1.4:1. Complaint Number 1: I wish Cushcraft would take an extra few minutes and mark the ends of joining boom sections with colored markers as KLM and Tonna have done for years. It takes longer than it should to measure each section and compare it to the diagram.

Cushcraft claims 17.2 dBd forward gain about the same as that of the 32-19. The front lobe (H-plane) is calculated to be 2 x 14.5 degrees—about 29 degrees total, which is fairly sharp. Front to back (F/B) ratio is claimed to be 30 dB at resonance, which is good. Our contest usage sort of backed up these figures, with strong signals from AB4L and K4LHB, in nearby Virginia, reduced by about that amount swinging the beam through 180 degrees.

Boom length is 18 feet 9 inches. The surprise for me was that I didn't have to use the boom brace. (That was because I didn't have enough hardware to finish assembling it!) Complaint Number 2: Lack of hardware was also a problem when I did the review on 32-19 for the January 1987 issue of *73*. (C'mon guys—put a few extra screws and nuts in the package!) We didn't really need the brace since boom sag was minimal. However, I strongly suggest using it if there are high winds or a lot of ice in the wintertime. Overall: An excellent choice for serious 220 DX work.

"Masting is easy. Use the lightest, cheapest 'junk' swaged mast you can get...."

Letters Department

Perry Yantis of Obetz, Ohio writes to ask just what the Japanese are up to in the 23-cm department. Perry would like to get on the band and has ordered an antenna, tower parts, and coaxial cable. He apparently got the impression from a Kenwood rep at Dayton that "Kenwood isn't interested in 23 cm." I've heard differently. And, I'm certain Kenwood doesn't want to miss out on Novice Enhancement! The problem is that any products we see in the USA will have been developed for the Japanese market first. So, for the time being we're stuck with the TR-50 for 23 cm FM. (This mode is very popular in Japan, by the way.)

Right now, the only multimode transceiver for 23 cm is the ICOM 1271A. This comes from stock with a less-than-average receiver, but works surprisingly well with the AG1200 preamp. The only limitation is that the preamp is rf-switched with a 15-Watt limit. This precludes tower mounting if you run any power. I assume that Perry is interested in weak-signal work. He didn't indicate this although buying a tower, antenna, and cable sure sounds suspicious to me. I predict the 1271A will stick around for a while. (I can't imagine they're selling like hotcakes, so there's no incentive to upgrade them technically.) It's a good choice, however, unless you want to go the somewhat cheaper transverter route.

Ev Tupis WB2ELB of Brockport, New York writes telling of a proposed UHF DXpedition to grid FN06 in Ontario on 220, 432, 903, and 1296 for the August UHF Contest. It will be history by the time you read this, but I'd like to hear how things worked out since this grid is quite a few miles north of Toronto—hence very rare. Ev also asks how to connect a TS-430S for transverter operation. Folks, tear this sheet out and put it in your file for future reference. Here we go!

Connecting a TS-430S

Using the standard 8-pin DIN plug, pin 1 and pin 3 are grounds; pin 2 is +12 volts at 5 mA on transmit (good for keying lines or a reed relay); pin 4 should be grounded to enable the transverter connection and to shut finals down; pin 5 is the 28-MHz receiver connection from the transverter; pin 6 is the ALC control for the transverter (if needed, usually not); pin 7 is the 28-MHz transmit connection to the transverter; and pin 8 is the optional low-band antenna (not used for transverter work).

Until October, see you Above and Beyond! ■

NEVER SAY DIE

from page 10

over, there's some good news—and there's some bad news. Which would you like first?

I might as well give you the good news first since there is so little of it. I mean, we're grasping at electronic straws here. Okay—though the effects of a bomb (euphemistically called a nuclear device) of from 10–50 megatons set off in space—around 250 miles up—and over the center of the U.S.—would be an almost total disaster for us electronically, the good part is that it wouldn't create any shock waves or fallout—it'd be a "clean" bomb, and as such would be unlikely to trigger a nuclear retaliation. There is a good deal of agreement that any attack would logically start with such a bomb.

Now for the bad part. The NEMP from such a bomb would wipe out virtually every solid-state device from coast to coast—every radio, TV, all solid-state car ignition systems (which means only very old cars would still be running—imagine the incredible traffic jam of dead cars, trucks, and buses—plus millions of people trying to get home on foot)—it'd be a mess, with all communications of every kind instantly wiped out over the entire country.

Since most of our telephone systems are solid state these days, we'd have no phone service—just like all our other emergencies—we're used to that. But, unlike other emergencies, the phone system would be out of service permanently—it wouldn't be anything which could be fixed in a few days or even months. The pulse would take out most satellites and microwave systems, so none of our communications systems would be operable.

We've been chuckling at the backward Russians, with their old tube equipment. Heck, they even use tube radios in their MIG-25 Foxbats! What dummies, right? EMP doesn't bother tube radios.

The pulse will be so intense that many people who happen to be leaning on metal fences are expected to be electrocuted. Of course, they're not sure about everything because we stopped testing bombs in space before we thought to measure NEMP pulses, so we're trying to work with the best fragmentary information we have.

Perhaps, instead of holding technology back from Russia, we might encourage them to go solid state—help them build IC plants and make it so eventually they'd be as helpless as we in the face of a high-altitude bomb.

Yes, your computers will be totally zapped—we're talking 50,000 volts per meter at ground level.

Well, what about protecting our ICs from such a blast? Yes, they're making headway with hardening solid-state circuits. The NEMP pulse is so short, around 5 nanoseconds (billionths), that our normal EMP filters—such as for lightening—are useless. all—NEMP will wipe out everything except a few old Goony Boxes, so there won't be any ham radio—or CB—or AM—or TV. For the first time in history DX ops are going to be able to have a decent QSO, even in the American part of the bands.

Oh, there's one more good part—ground-level bombs will only wipe out electronic equipment for a short range, so we don't have to worry about a national disaster when the first terrorist group finally manages to smuggle a bomb into downtown Manhattan and sets it off. If our government can't stop tons of cocaine, pot, heroin, and hash from being smuggled, what chance have they of stopping a suitcase-sized nuke—one like we saw on the Connections PBS program a few months ago?

We have the prospect that an angry or frustrated USSR—an angry China, Pakistan, India, Israel, France, etc.—could lob a nuke up over Nebraska some day and bring the U.S. totally to a stop—no businesses can run without computers and phones—no one can get to work without a car—no business can operate without a phone—no food distribution—you get the picture.

"...instead of holding technology back from Russia...encourage them to go solid state...so...they'd be as helpless as we in the face of a high-altitude bomb."

What seems to work best is to build a small pi-filter with bypass zener diodes into every pin of ICs. This adds to both their cost and size, but they think it'll do the job.

The prospect of adding these circuits to every IC made so that eventually our computers, cars, telephone switchers, radios, TVs, hi-fi's, and digital watches will be operable after a blast—particularly where most of our consumer electronic equipment is designed and built in Japan and where consumers will do almost anything to save a buck (it's obvious that hardened IC are going to be more expensive than soft ones)—isn't bright.

That brings up one more good aspect of the situation for us. Many of us have been worrying that the few hams we have left, using voice and Morse circuits, would be unable to handle the enormous volume of traffic a nuclear attack would demand. Now we realize this isn't a problem at

With everything else in communications wiped out, all we'll have is our 150,000 mostly-retired hams for communications—and we'll be as out of business as everyone else. Our IC factories won't work without computer-operated numerical control equipment, so we won't even be able to start making new radios and phone switching equipment.

I admit the bad news somewhat overshadows the good, exacerbated a bit because there aren't any simple solutions. If it would do any good I'd be glad to be mad as hell over our government's consistent cover-up of this news. Even the recent effort by two public-spirited hams to try and get the FCC to get the government to level with us about the problem got tied up in the usual bureaucratic double-speak.

One approach is to just heave a sigh and say nothing can be done, so let's just hope no one gets mad at us. Hey, yes, I know everyone is already mad at the U.S., but I didn't say that was a realistic approach.

Another is to keep after the FCC and our government secret-keepers (this information is far too dangerous for us to let the public know) to give us the best information they do have on how we can protect our solid-state gear against NEMP. They certainly aren't keeping any secrets from the USSR, which by now may know a heck of a lot more about NEMP than we do.

Once we have the best information we can get we'll have something to work with. If we have to start building emergency tube radios, let's know it. If they're going to start making hardened ICs we need to know about that too. Or can we keep our HTs in completely shielded boxes which will insulate them from the burst? If so, we need to know about it so someone can start making burst-proof boxes for us to keep our transistor gadgets in. I'll need the king-size to hold a few HTs, a couple of Model 100 computers, some portable radios, TV cameras, my 35mm cameras (which are all solid-state operated these days), watches, and like that.

Did you read *Lucifer's Hammer*, a novel about what might happen should a comet hit the earth? Too bad—you missed an exciting book. Pocketbook. I'd like to see some stories on what our country would be like with all solid-state devices blown in a few billionths of a second. Suddenly no communications, little transportation, businesses stopped, food stopped—power stopped. I wonder what happens to a nuclear power station when every electronic control and the meters to see what's going on are suddenly destroyed?

Without communications could we even manage to retaliate if we wanted to? I remember all too well that the Pentagon had to rely for several days on amateur radio communications to keep in touch with their SAC bases after the big Alaska earthquake.

Did the FCC kill their all-volunteer Long Range Planning Committee, which was made up of communications industry leaders, because they were frustrated over being unable to get amateur radio growing again—realizing that am-

ateur radio was the only practical communications service which would be available in a time of extreme emergency—or did they give up even trying to encourage a communications safety net for the country because it seemed hopeless in the face of NEMP?

Unless any plans for facing this problem are so well hidden that even hints of it are invisible, it sure appears as if the fundamental government policy is that the situation is so completely hopeless that it isn't worth even trying to solve it—but, whatever we do, don't let the public know. Lordy, if the public ever got wind of this they'd demand some action—and we don't have a clue of how to cope with this.

My suggestion—information. I've read widely conflicting reports on the impact of EMP. The unsettling aspect is that the optimistic reports seem to come from writers who are just writers, not scientists—writers who accept the bland government assurances that well, it may not be so bad...we don't really know.

Unless Mars happens to be in the same neighborhood of the solar system as Earth we could find ourselves answering a Martian CQ and then listening eight or ten minutes later to see if we got through. Don't bother me about QSLs.

The bright side: some of the *73* readers are working with defense contractors on the NEMP problem—so perhaps it will be possible to get some information about it into print so we can start organizing ourselves to honor our mandate to provide communications in emergencies. I'll bet there are some solutions—or there at least will be if we start pushing.

Okay, class is out—now you can go back on two meters and discuss last night's ballgame—or take turns making my life miserable on 20m. ■

SPECIAL EVENTS

NOTE: Space limitations (we hope only for this month) required reporting only basic data plus address/phone numbers for additional information.

AUG 29
HAGERSTOWN MD

Antietam Radio Association station W3CWC on 80-,40-,20-,15,-10-meter phone, CW, and RTTY. QSL and legal-size SASE to W3CWC, POB 52, Hagerstown MD 21741.

REDONDO BEACH CA

Sixth ARRL Amateur Radio Networking Conference, 9 am to 6 pm, TRW Space and Technology facility, Compton Blvd. Call Paul Rinaldo W4RI at Newington CT (203) 666-1541 or Harold Price NK6K at Redondo Beach (213) 376-3147.

WEBSTER NY

Xerox Amateur RC station KE2T 1400Z-1900Z on General portions of the 20-,15-, and 10-meter phone bands. QSLs and also contacts through the 224.26 repeater (WB2SUN/R) to XARC, 800 Phillips Rd., Bldg. 337, Webster NY 14580.

SEP 5-6
HESTON IN

The Porter County ARC, N9RD 1300Z to 2300Z on phone-3.966, 14.266, 21.266, 28.466; CW on request. QSL: Jurgen N9RD or Tom KB8AC, PO Box 1782, Valparaiso IN 46383.

SEP 5-7
TUCSON AZ

The Old Pueblo RC, W7GV 0000Z 5th to 2200Z 7th on new Novice/Tech 10-meter SSB frequencies: SSB-3.980, 7.280, 14.280, 21.380, 28.380; CW-3.730, 7.130, 14.060, 21.130, 28.130; FM-via link and packet. QSL: 8 1/2 x 11 SA 39-cent SE to POB 42601, Tucson AZ 85733. Bill Croghan WBØBW, 1854 West Dominy St., Tucson AZ 85713 (602) 622-1535.

WATERFORD CT

The Tri-City ARC, KA1BB from the I-95 weigh station from 1700Z 5th to 2300Z 7th. Frequencies: 28.325, 14.295, 7.245, 3.395 MHz phone or 7.130, 7.075, 14.145 MHz CW. Talk-in to coffee stop on FM 146.52 and CB 19. QSL: Letter-size SASE Tri-City ARC, POBox 686, Groton CT 06340. Bob Dargel KA1BB, 8 Willow Lane, East Lyme CT 06333 (203) 739-8016.

SEP 6
SCHAUMBERG IL

The Schaumberg ARC, WB9TXO from 1500-2000Z. Frequencies: 7.250, 14.250, 28.400 MHz. QSL: SARC, PO Box 68251, Schaumberg IL 60168-0251.

SEP 11-12
LEDYARD CT

Tri-City ARC, K1FSC, 1400-2400Z 11th, 1800-2000Z 12th on 14.295 or 7.245 MHz phone, 7.130 MHz CW. QSL: Letter-size SASE to Tri-City ARC, POB 686, Groton CT 06340.

WINSTED CT

The Quinnipiac Council, W1GB, 2330-0400Z 11/12, and 1200-0400Z 12/13, phone-3.920, 7.240, 14.290, 21.340, 28.400; CW-3.725, 7.125, 21.150. QSL: SASE to Skip Paquette KA1EAJ, 121 West Dayton Hill, Wallingford CT 06492.

SEP 12
VALPARAISO IN

N9RD 1800Z-2400Z (see Heston IN above). 9x12 SASE.

GLEN ELLYN IL

The Northern Illinois DX Association - 35th W9DXCC Convention at the Holiday Inn, 1250 Roosevelt Rd. Contact: Howie Huntington K9KM, 65 South Burr Oak Dr., Lake Zurich IL 60047.

UNIONTOWN PA

The W3PIE, Uniontown ARC 38th annual Gabfest at the club, old Pittsburgh road just off Route 51. Talk-in on 147.045/645; 144.57/145.17. Pre-registration $3, 2/$5. John T. Cermak WB3DOD, PO Box 433, Republic PA 15475 (412) 246-2870.

WINDSOR ME

The ARRL-sanctioned Windsor Hamfest, Southern Kennebec Agricultural Society fairgrounds. Gate donation $2. Camping $3; $5/2 nights. Talk in, W1TKLC 146.22/.82 repeater. Phil W1JTH, 47 Longwood Ave., Augusta ME 04330 (207) 622-1385.

SEP 12-13
MOBILE AL

The Mobile ARC Hospitality Hamfest 9 a.m., Texas St. Rec Center. Talk-in 146.22/.82. $2 at door. MARC, POB 7232, Mobile AL 36607; N4MFQ (205)-471-4717; KB4JET (205)-865-4404.

BETHLEHEM CT

The Hen House Gang ARC W1FHP 63rd ARGI Fair. Novice band 10m, 40m, 20m SSB daylight hours. Contact: W1FHP, President, Hard Hill Rd., Bethlehem CT 06751.

SEP 13
DANBURY CT

The Candlewood ARC hamfest and flea market 9 to 3, Danbury Elk's Club, 346 Main St. Talk-in 147.72/.12. Call Gene Marino W1IDH (203) 426-8852 for table, admission rates, etc.

WILLOW SPRINGS IL

The Bolingbrook ARS Ham/Computer Fest 6 a.m., Santa Fe Park, 91st and Wolf Road in Willow Springs. Talk-in on 147.33/.93 or 146.52. Ed Weinstein WD9AYR, 7511 Walnut Ave., Woodridge IL 60517 (312)-985-0527.

LA PORTE IN

La Porte Summer Hamfest, county fairgrounds, SR 2. Talk-in on 146.52. Paul KA9UKW, PO Box 30, LaPorte IN 46350.

MARSHALL MO

The Indian Foothills ARC hamfest, Marshall Senior Citizens Building, 8:00 a.m. Talk-in on 147.84/.24. Exams 9 a.m. Randy Ebers KEØM, 125 Lakeview, Marshall MO 65340.

MONETT MO

The Ozarks ARS Club Congress and Swapfest, city park (corner of highways 60 and 37), 9:00 a.m. Talk-in on 146.37/.97.

FINDLAY OH

Findlay RC (W8FT) Hamfest, 8 a.m., at Hancock County Fairgrounds. FRC Hamfest, PO Box 587, Findlay OH 45839-0587.

BUTLER PA

The Butler Hamfest, Butler Farm Show Grounds on Route 68. Contact: John Varljen K3HJH, 174 Oak Hills Heights, Butler PA 16001 (412) 283-9403.

SEP 15-19
ATLANTIC CITY NJ

Southern Counties ARA, K2BR, from Miss America Pageant. Phone-25 kHz (inside lower General class band edge); CW-65 kHz inside lower band edge; Novice-7.125, 21.150 MHz. QSL: SASE to SCARA, Box 211, Linwood NH 08221.

SEP 18-20
WRIGHT-PATTERSON AFB OH

The Base MARS station and the Dayton ARA, 1300Z-2100Z each day, AGA1WP on 3229.5, 7528.5, 14,528.5, and 20,874.5 kHz and W8BI in General Class phone portionss of the amateur bands and Novice/Tech 10-meter phone/CW band. All QSLs: SASE to W8BI, PO Box 44, Dayton OH 45401. Contact: Paula DiGennaro KA8HQJ, 7136 Pineview Dr., Huber Heights OH 45424 (513) 233-9018.

SEP 19
DETROIT MI

Southeastern Michigan DX Association, K8JP. (Pope John Paul visit) 0001-2400Z. Phone, CW 10 thru 80 meters. QSL: SASE to Larry Zabkowski K8NLD, 18082 Gaylord, Fraser MI 48026.

NORMAN OK

The South Canadian ARS, W5OU from 1400Z-2400Z, on 7.237, 14.237, 21.337, 28.337 phone phone; 14.087 RTTY/AMTOR; 145.01 packet; FM-147.060 (± 600); and ATV-439.25. QSL: 9x12 SA 39-cent SE to SCARS c/o KD5IT, 2735 Poplar Lane, Norman OK 73072.

PONCA CITY OK

The Oklahoma Independent ARC Ham Hamgover Hamfest and electronics show, National Guard Armory, 9:00 a.m. Talk-in on .37/.97. Contact: Lin Jackson KA5ZJM, 350 South Birch St., Ponca City OK 74603 (405) 762-7299.

SEBASTOPOL CA

Sonoma County Radio Amateurs, flea market, 8:00 to 2:00, Sebastopol Community Center, 390 Morris St. VEC exams. Talk-in on 146.13/.73. SCRA, Box 116, Santa Rosa CA 95402. Table info etc., Alan N1AL, (707) 538-7115 eves; 577-3981 days.

BARRIE ONTARIO CANADA

The Hex-9 Group, Barrie ARC. Packet Radio Symposium, Georgian College, 9:30 a.m. Talk-in 146.25/146.85 VE3LSR. R.S.O. Annual Convention also. Box 254, Barrie, Ontario L4M 4T2 Canada.

SEP 19-20
PEORIA IL

EMSP Peoria Area ARC Superfest '87, Exposition Gardens, off West Northmoor Rd. 6:00 a.m. Commercial buildings open 9:00. Talk-in 146.16/146.76, W9UVI. Reserve for banquet. PAARC, PO Box 3461, Peoria IL 61614 (309) 674-5656.

WICHITA FALLS TX

WARS hamfest, Activity Center at 10th and Indiana Sts., 8 to 4 19th, 8 to 2 20th. Talk-in on .74/.14, .34/.94, 449.30/4.30. All info, reservations, Steve Guerra WB5LCN, PO Box 4363, Witchita Falls TX 76308 (817) 723-6500.

SEP 20
CAMBRIDGE MA

MIT Electronics Research Society and UHF Repeater Association Flea Market, 9 to 4 (sellers, 7 a.m.) Albany and Main Sts. Talk-in 146.52, 449.2/444.2-PL 114.8(2A)-W1XM/R. Contact: MIT UHF Repeater Association, 4 Madison St., Belmont MA 02178.

CHICAGO IL

Chicago ARC, "OPEN HOUSE—World of Amateur Radio," 11 to 5, North Park Village, 5801 N. Pulaski. Experts demonstrate all aspects of ham radio. Call 545-3622 for info; Novice classes.

ADRIAN MI

The Adrian ARC W8TQE/R 15th annual Hamfest 8 to 3, Lenawee Fair Grounds. Talk-in 145.37/444.675 W8TQE/R. Contact: Adrian ARC, PO Box 26, Adrian MI 49221.

GRAND RAPIDS MI

The Grand Rapids ARC annual Swap and Shop 8 a.m., West Catholic High School, 1801 Bristol NW. Talk-in .86/.26, 224.64. Tables, admission rates, etc. call Don Hazelswart KA8BCI (616) 363-0649; write Grand Rapids ARC, PO Box 1248, Grand Rapids MI 49501.

PENNSAUKEN NJ

The South Jersey RA 39th annual Hamfest, 8 to 2, Pennsauken Senior High School, Route 73 and Remmington Ave. Talk-in 145.290. Info/tickets: Fred Holler W2EKB, 348 Bortons Mill Rd., Cherry Hill NJ (609) 795-0577.

OLD WESTBURY NY

The LIMARC ARRL Long Island Hamfair, 7:30 a.m. sellers; 9:00 a.m buyers, the New York Institute of Technology, Route 25A/Northern Blvd. Talk-in 146.25/.85. Contact: Henk Wener WB2ALW (516) 484-4322.

SEP 26
WASECA MN

The Viking ARC 17th annual Swapfest 8 a.m., Waseca High School. Talk-in .34/.94. Contact: VARS, PO Box 3, Waseca MN 56093.

HORSEHEADS NY

The Elmira ARC 12th annual International Hamfest 6 a.m., Chemung County Fairgrounds. Info/tickewts Steve Zolkosky, 118 East 8th St., Elmira Heights NY 14903.

LUMBERTON NC

The Carolina ARL station KS4S 1300 UTC to 2100 UTC Frequencies: 3.870, 7.240, 14.290 kHz on 28.400 kHz on the half hour. Certificate: QSL to C.A.R.L., PO Box 2208, Lumberton NC 28359.

SEP 26-27
GRAYSLAKE IL

The Chicago FM club Ham and Computer Fest, Lake County Fair Grounds, Route 120 & 45. Talk-in 146.16/.76. Tickets: advance $4; gate $5. Info/tickets SASE to Expo Tickets, PO Box 1532, Evanston IL 60204.

FAIRMONT IN

The GCARC operates station W9EBN from 1700Z 26-1700Z 27. Operation 10 kHz lower end telephone band 20-, 40-, 80 meters and 28.350 Novice Band. Certificate: QSL and SASE to KA9TBM or N9FBB at call book address.

WALLA WALLA WA

The Walla Walla Valley ARC annual Hamfest 8 a.m., Oregon Community Building, Milton-Freewater. Talk-in 147.88/.28, .52. Contact: Bernie Frazier WA7CBX, 610 South First Ave., Walla Walla WA 99362 (509) 529-9879.

SEP 27
BOULDER CO

The Boulder ARC annual Fall Barcfest Swap Meet 8 a.m., National Guard Amory, 4750 North Broadway. Talk-in 146.10/.70. Contact: Dale Scott KAØQV, 304 East Cleveland St., Lafayette CO 80026 (303) 665-2364.

WILLIMANTIC CT

The Natchaug ARA 5th annual flea market 9:00 a.m., Elks Home, 198 Pleasant St. Talk-in .90/.30, .52. Contact: Ed Sadeski KA1HR, 49 Circle Dr., Mansfield Center CT 06250 (203) 456-7029.

GAINSVILLE GA

The Lanierland ARC 14th annual Hamfest 8:30 a.m., Georgia Mountain Center. VEC exams given. Talk-in 146.07/.67. Contact: Phil Loveless KC4UC, 4949 Red Oak Dr., Gainesville GA 30506 (404) 532-9160.

NEW BERLIN IL

The SVRC ham/computer swap, Sangamon County Fairgrounds. Camping OK. Contact: SVRC, PO Box 8252, Springfield IL 62791.

ST. PETERS MO

The St. Peters ARC 3rd annual Swapfest 6 a.m., Golden Triangle Park. Talk-in 145.41/145.33. Contact: Jason Zwyers KAØNIR, 1084 Crestwood Lane, O'Fallon MO 63366.

BEREA OH

The Cleveland Hamfest Association annual hamfest/computer show setup 6 a.m; opens 8 a.m., Cuyahoga County Fairgrounds. Talk-in 146.52. Contact: C.H.A., PO Box 81252, Cleveland OH 44181-0252.

SEP 27-29
WASHINGTON DC

The Microwave Communications Associationannual convention, Ramada Renaissance Hotel. Theme: "The Future Medium for Entertainment and Education." Contact: Elena Selin, 2000 L St., NW, Suite 200, Washington DC 20036 (301) 464-8408.

QRP

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

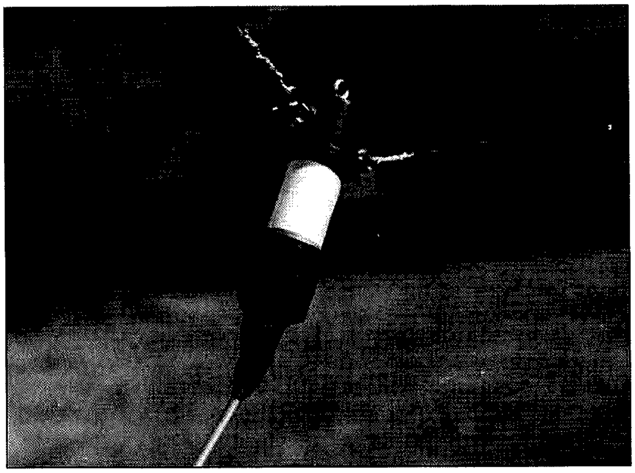


Photo A. One of the baluns on my antenna system. Note coax sealer and the soldered connection to the balun and antenna wire.

**AUTUMN—
ANTENNA REPAIR SEASON**

Have you noticed? The days are growing longer, the night air is a bit cooler. Autumn is slowly heading our way. Before too long, we'll have snow here in Ohio. So right now is the perfect time to fix, tune, and install antennas.

The antenna is without a doubt the single most important piece of equipment outside the shack. Remember last year when I told you that your QRP signal is only 3 S-units lower than someone running 100 watts? Well, that's still true. Let's take our example one step further. Let's say Bob is running a modern 100-watt solid state radio into a dipole. You're running 3 Watts into a dipole. In this example, you'll really only be 3 S-units lower. You'll be able to break and work a fair amount of DX with that setup. However, let's say that Bob flips on the switch to his three holer (three 3-500Zs running with 2100 volts on the plate) for the kW. If you're skilled in the fine art of QRP, you still can work some of the pileups. Bob now switches over to his monoband wide-spaced beam on top of a 80-foot tower feeding the antenna with nitrogen-filled hardline. You may as well shut down and watch TV, and hope that Bob's rf doesn't interfere with *that*. You just can't compete on that level.

Antennas hold the key to successful QRP operation. Nothing less than the best will do. Anything less than optimum antennas will cause nothing but grief.

How do you go about installing the best antenna for your station? Learn the basics, purchase the *ARRL Antenna* book, and read this month's issue of *73* cover to cover. It's full of antennas to dream about and to build.

The efficiency of the antenna system is number one on your list. Antennas should be the primary consideration when upgrading the QRP station. Some of the stuff I have used to make contacts would leave most people rolling on the floor with laughter. A lot of my gear is wired and tested with alligator leads, but it works! My point is this—if it produces rf, it needs an effective antenna to work.

After moving to the city, I found that installing an 80-meter dipole within a city lot takes quite a bit of skill. I was able to shoehorn every inch of wire within the lot, but the antenna wasn't anything to write home to Mom about. How does one improve the efficiency of the antenna system? Follow these steps and you will begin to fill up those log sheets faster than before.

Let's start with the transmitter. From the coax connector to the antenna, how many OTHER things are in the line? Wattmeters? Antenna switches? swr bridges? Three dozen barrel connectors? Step one: get rid of ALL UNNECESSARY DEVICES IN THE FEED LINE TO THE ANTENNA. This is of utmost importance when running QRP. The kW boys can stand to lose a watt or two in the swr bridge, connectors, and whatnots, but you CAN'T! When you only have two watts to start with, you just can't afford to lose half a watt or so in feedline goodies. The only time I install a wattmeter/swr bridge is during testing or troubleshooting the antenna system. The only switch in the antenna line is a remote Heathkit switch mounted on the tower. When I change from one radio to another, I reach behind the radio, unscrew the antenna lead, and move it to the other radio. Yes, this is slow and wears out the connectors and the cable, but that's the way I do it. Remember that even the best antenna switch in the world has some insertion loss, even if the loss is measured in fractions of a dB. Add all those fractions together and you'll end up with a dB's worth of loss just in switches.

Got an antenna tuner in line? If you try to kid yourself into thinking you can resonate your 40-meter dipole on 160, think again. It's possible, but so much of the rf is going nowhere in the tuner that very little is making it to the antenna. Antenna tuners are great critters for adjusting an already resonating antenna, enabling operation from one end of the band to another, but they are not for the purpose of resonating a poor antenna for a second band. Sometimes the use of a tuner is mandatory, as is the case with the G5RV antenna.

The curse of ham radio operators: swr. Don't concern yourself with getting the swr bridge to read exactly 1:1. It will not make much difference if the antenna swr is 1:1.8, or even a bit higher. Some of the newer, solid-state radios will reduce their output if the swr is too high, but we need not worry about swr shutdown when running two watts. I sleep just fine with an swr of 1:3; a bit higher than that, and I'll toss and turn some at night.

"Antennas hold the key to successful QRP operation."

What type of coax is running up to the antennas? What condition is it in? When was the last time you replaced the coax? These are some of the little things that need your attention to achieve maximum antenna efficiency.

What's the best coax to use? Just get a good brand name and remember the old saying, "You get what you pay for." This is oh—so true when it comes to coax. I have been running RG-8U as the main feed to the antennas in my shack for some time now, and have found it to be perfect for connecting the antennas to my remote switch. However, some of the newer cable I've read about offers better specifications than the RG-8U. These cables include the following: Belden 9913, which is great for 2 meters; and 450, which is somewhat of a poor man's hardline. You might also use RG-213 and RG-217; the RG-213 being the most popular. The cables RG-214 and RG-223 are double-shielded versions of RG-213 and RG-217. In my opinion, the use of double-shielded cable for HF operation is overkill. RG-8U is a rather thick, heavy coax which is cumbersome to use, and I prefer to use the micro-8 cable (also called mini-8 or RG-8X). For goodness sake, don't use RG-58U cable anywhere, not even for mobile use!

Coax cable should be replaced every five years. I know. . . who does that? Well, *I* do (it is true, however, that I don't have an 80-foot tower, so the cost is very low). For a dedicated low-power operator, however, even with a high tower, it is money well spent.

From the coax to the actual antenna, what is the best antenna? The one that works on your size lot. Don't use traps in the antenna if you can avoid them, as they are "lossy"; use resonant antennas instead. To operate a multi-band antenna, try a G5RV and a tuner (another "lossy" device but necessary for the G5RV). My city lot will not hold a 40-meter dipole horizontal. I configured it to a inverted vee. If that is also your plight, keep the ends of the vee as high off the ground as possible. Use a side arm to keep the apex of the vee out and away from the tower.

Baluns—who knows how well they function, but they sure are

nice to connect coax to. Book after book has been written about the benefits and evils of these devices. I use one on every coaxial feed antenna. Do they work for me? I just can't say!

When connecting the coax connector to the antenna, with or without a balun, first wrap a layer of electrical tape around the PL-239. Then wrap the connection with some of that sticky coax connector sealer, such as Coax Seal™, which you can get at Radio Shack. The tape allows the coax sealer to be removed without too much mess. This is the ideal thing to do if you like to experiment with antennas and are constantly changing the feed line.

For 20, 15, and 10 meters, some type of directional antenna is a must. You can use a dipole, which hasn't the gain and directionality of a beam (either quad or yagi), but you're rowing upstream. I have been using a old Wilson system for two years, and find it to be quite satisfactory. For those with limited funds and smaller lots, check out the Butternut Butterfly beam.

Unless you have the time and the space for all those radials, think twice about the use of a vertical antenna. It has all those traps to worry about. The vertical would produce very good DX because of its low angle of radiation but, in most cases, the installation is not perfect and the results suffer. Vertical antennas radiate poorly in all directions.

In summary: remove all inline goodies from the coax; use resonant antennas; fit the greatest amount of antenna into the given space; use high-quality coax and replace it every five years; and seal the coax connections against the weather. Also, use a directional antenna for 20, 15 and 10 meters and resist the temptation to install traps in the antenna. Don't worry too much about obtaining 1:1 swr. Finally, remember that no one QRP'er will ever know everything there is to know about antennas. That's a fact of life.

I got letters from a lot of homebrewers who built the 6L6 special. I plan to do a 6L6 update very soon. Keep the photos coming. Who says no one builds anymore—QRP'ers do!

That's about all for this month. Next month I'll dig into the mail bag, since October marks the first anniversary of the QRP column in *73 Magazine*. ■

DX

Chod Harris VP2ML
PO Box 4881
Santa Rosa CA 95402

ANDAMANS ADVENTURE

[Bernhard Stefan DL2GAC is a world traveller who saves up his funds while working in West Germany, and then takes a prolonged (many months) DXpedition to various rare and exotic locations. Many DXers would love to follow that life style! Bernhard recently returned from several months in India, including the Andaman Islands, and he shares his experiences with *73* readers.—VP2ML]

As VU2BMS in India, I had worked the VU4APR Andamanson the first day of their operation and the thought, "Why not go there again?" flashed through my mind. So I extended my proposed stay in India for two weeks and got a booking from Madras to Port Blair and an open ticket from there to Calcutta. In Madras I heard that two stations were set up in Port Blair, one at the Tourist Home and the other at a 5-star hotel. My flight left at 6:20 a.m. After I arrived I booked into the Youth Hostel in Port Blair, which is, at 5 rupees per night, the cheapest place to stay. An hour later I went looking for the stations. The Tourist Home I knew and it fitted as a suitable QTH. The 5-star hotel, I guessed, would probably be newly constructed (construction is still going on) Aasiana Hotel. My guess was correct, because on approaching it I could see a beam on top.

The manager of the hotel introduced me to the present and sole operator Bharathi VU2RBI and we had a two hour conversation and lunch together. I returned in that evening and met Jose VU2JOS, who was helping Bharathi to hang the 160-meter longwire antenna up higher. Bharathi had only managed two 160-meter contacts so far: one with an ON-station [ON4UN, I bet—VP2ML], and the other, I believe, with a JA station. She didn't try very long afterwards without success and I don't think there were any other additional 160-meter contacts. I observed on one side of the room the 20-meter SSB activity of Bharathi and on the other side the 40-meter activity of Jose.

I kept a low profile for the next few days, because I didn't want to spoil my really good reception through too much hanging around. For sure, I would have loved to get on the air, but my Indian license was without the necessary endorsement for operation from Andamans.

On March 15 three new operators arrived by ship and Suri VU2MY, the director of the National Institute of Amateur Radio (NIAR), came with VU2DS and JR1AIB [of the Japanese DX Family Foundation—VP2ML] by plane from Delhi via Madras. The same day I attended a presentation of our hobby to a group of about 30 local people, who were interested in getting involved and in getting a ham license. Maybe there will soon be a local licensee, since there have already been three or four similar presentations by the operators of VU4APR and VU4NRO. The operation has created a lot of awareness with the local people and the local administration, before this operation nobody knew what ham radio was all about. They probably thought of hams as some kind of secret society engaged in some illegal operation not far away from spying.

Suri had come with Daljit Singh VU2DS from Delhi who had the latest news. Daljit is working for the monitoring service in Delhi and he has been instrumental in getting a license for VU4APR. He insisted that he had come as an operator and not on an official mission, but he has some kind of presence with the authorities. Suri said that there are applications for operation from Andamans from three different groups of foreigners pending right now. One is from an OH group, one from a W6 group, and another nationality he didn't mention. The OH group applied a year ago and the W6 group fairly recently. The application for the VU4APR activity has been pending for three years.

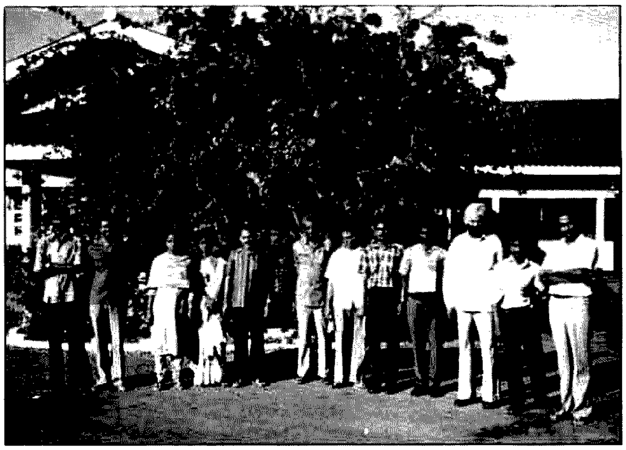


Photo A. Some of the operators of VU4APR in the Andamans in front of the Tourist Home.

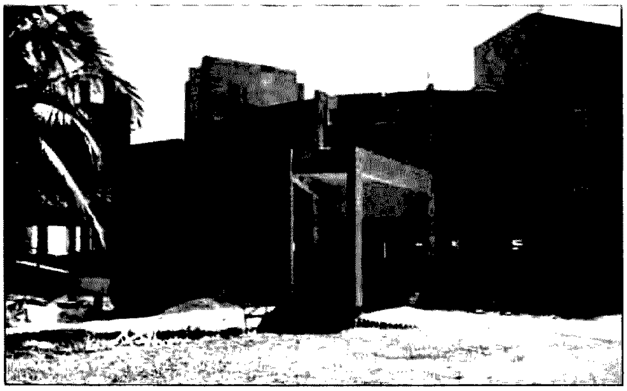
Rajiph Gandhi [VU2RG and Prime Minister of India—VP2ML] visited the Andamans in December 1986 or January 1987 and promised assistance from the central government for the economic development of the islands. This assistance is intended to boost tourism. At present there are only about 300 hotel beds available in Port Blair. By 1990 the planned number is 1000. There is a lot of new construction that hadn't begun when I visited Port Blair two years ago.

The construction of a new hotel began in 1986. Its foundation is laid on top of bunkers left over from the Japanese occupation during World War II. The hotel faces eastward toward the open sea.

The visit of VU2RG to Andamans was probably the decisive factor in granting the present license and future licenses to foreigners. Suri and Bharathi had an audience with the Prime Minister in January and the whole VU4APR gang will have one again in April. It was shortly after their audience that the license was issued.

On March 16 there was a luncheon for all the operators, myself, and JR1AIB. Suri talked afterward about the QSLing for the operation. All QSLs should be sent "direct" to VU2APR. Any QSLs sent via bureaus will be processed very slowly. Suri said that all QSLs for VU4APR and NRO will be mailed by April 30 direct to the National QSL Bureaus of the different countries. The cards are already printed. The group is expecting to make 20,000 to 25,000 contacts, which to my mind is not a very high estimate.

I was asked if I had any comments on the operation. I could have said several things, but I only said that for future operations they should try to get more shorter callsigns. They've been discussing operations in Lakshadweep [Laccadives] and Bhutan. Operations should be under one callsign without the addition of "operator". Identifications like VU4APR/RBI/JOS are according to Indian rules. VU2DS responded that for future activities this will be no problem. He said that the next group could get VU4A, for example, as a call. ■



The new hotel Aasiana, Port Blair, Andaman Islands.

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Avenue
Saugus CA 91350

KANSAS AND MISSOURI FACE OFF

Last month, I ended by saying I would attempt to explain the current rivalry over coordination efforts for the Kansas City area that's been plaguing Kansas and Missouri. Well, I tried. In fact, I spent the better part of several weekends trying to put together a short history of the problem. Guess what? A "short history" took up sixteen double-spaced pages. And that was far from complete! So, rather than a detailed explanation of just who is goring whose ox—let's keep it short and sweet.

About two decades ago there was *no coordinator* for either Kansas or Missouri. They weren't needed then. But, when more and more repeaters took to the air in Kansas City, a local ham set up as a coordinator to help "keep the peace." Since growth in Kansas City was more rapid than the growth in more rural sectors of both states, this system worked well.

Enter repeater politics and repeater politicians. As more repeaters came on the air, both Kansas and Missouri felt the need of statewide repeater councils. Both states then formed councils. Eventually, however, someone figured that these councils rather than the local hams should decide who would coordinate for Kansas City. As far as I can tell, it wasn't a matter of the existing coordinator doing a good or a bad job. Rather (just like in the world of big business) the normal policy of any major entity is to put its own people in charge when it takes over. And, like it or not, fair or not, that's the way that business operates. It also seems to be the way most repeater councils operate as well.

There was only one problem. The Kansas City coordinator refused to be replaced! Instead, he garnered the support of the local council of radio clubs and continued performing Kansas City coordinations. In the meantime, the Missouri and Kansas state councils became a part of a region wide "umbrella" coordination organization, the Mid-America Repeater Council (MACC). The MACC then lent its support to the Missouri Repeater Council (MRC) and the Kansas Repeater Council (KRC) rather than to the existing Kansas City coordinator. Getting rather complex, isn't it?

That was the status quo until the Nebraska state coordinator and then ARRL VHF Repeater Advisory Committee Chairman, Joe Eisenberg WA0WRI, wrote to the FCC Special Services Division Chief, Raymond A. Kowalski, asking that Kowalski make a determination in the matter. Ray did just that. In fact, he did so twice. The first letter was to Eisenberg informing him that the FCC would rely on regional or state coordinators to determine the validity of any local coordinator. Simply stated, the MRC and the KRC had the right to oust the present Kansas City coordinator. As you might expect, this didn't sit well with most of the folks in Kansas City.

They, in turn, bombarded poor Ray with their side of the story through the Mo-Kan Council of Amateur Radio Clubs. Their action persuaded Division Chief Kowalski that in this particular case some extenuating circumstances might exist that would cause him to reevaluate his earlier decision. Not that such circumstances *did* exist, only that they *might* exist.

Anyhow, at this time, that's how the situation stands. The Mo-Kan Council supports the long-time local Kansas City coordinator and the statewide councils, with the apparent backing of the regional umbrella organization, are determined to put their own man in power.

Since the FCC is so wishy-washy and refuses to make a final determination one way or the other, and, since neither side appears ready to give even a fraction of an inch, I can see only one way that a final determination can be reached. Sadly, it will probably be ham versus ham in a court of law. Worse, the outcome there will eventually have an impact on us all.

My opinion? Well, I've been to Kansas City twice during this three-year-long confrontation and I've had a chance to meet all the parties involved and listen to their viewpoints. I've also read the letter from Eisenberg to the FCC; Kowalski's response; the correspondence from Mo-Kan to the FCC; Kowalski's response to that; and I've talked to Ray on the phone many times about this and other repeater coordination issues.

Here's where I become unpopular with some sections of Mid-West ham radio society. Frankly, I feel that Ray Kowalski made the right decision when he said that in all cases, the FCC would rely on state and regional coordinators to give sanction and validity to the work of any local coordinators. No! It may not be right from the standpoint of a man who has devoted 17 to 20 years of his life coordinating repeaters and now feels as if he's been kicked in the face by a bunch of newcomers. Morally, however, it's the correct decision because it takes into consideration something far more important—the needs of the many may outweigh the needs of the few.

"The move to replace the Kansas City coordinator. . . is based on partisan politics rather than the need for greater expertise."

After all, this is 1987, not 1967, and what worked well during 60s, 70s, and early 80s may not work well in the late 80s or on into the 21st century. In the 70s, Kansas City could afford to isolate itself from other state or regional coordination efforts with little adverse impact. I don't think this is possible today. However, in the same breath I ask the MRC, KRC, and MACC why it's so "politically important" for them to replace someone who has volunteered 17 years of his life to a project. Obviously, if he didn't have the expertise, he would have been run out of Kansas City on a rail years ago. Instead, when the state-wide councils tried to replace him, an entire city rallied to his side. This, more then anything else, convinces me that the need to replace him is purely political in nature. Not that the move itself is wrong, but rather that it's based on partisan politics rather than the need for any greater expertise.

Is there any solution? Yes, and it's a simple one. Let the current and popular Kansas City coordinator continue in the role, but bring him under the auspices of the KRC, MRC, and MACC.

Will this happen? It's doubtful. Too much "ox goring" has taken place and from my observations when I visited Kansas City last April, I can only say that everyone appears intransigent. And, that's why I think that this will be the first "coordinator vs. coordinator" case to land in the courts. In the meantime, it's the hams of the area who will suffer the most.

HF HEROES

We have some new local heroes in southern California. They are hobby radio enthusiasts and they are credited with using their radio gear to save the lives of a couple on a storm ravaged yacht. But, there's an interesting twist to this story. Here's what happened.

Searchers from the U.S. Coast Guard, guided by radio hobbyists in Tahiti and southern California, rescued a couple from Washington state who had been adrift for three days on their damaged sailboat about 720 miles south-southwest of San Diego.

The drama began June 18 when an operator from Laguna Beach, California, identified only as Dean, called the Coast Guard Station in Long Beach to relay information from an operator in Tahiti named Gerard of the yacht's distress call. The Coast Guard had been looking for the boat since it was reported missing on June 18. The first search, by Coast Guard jet, had covered an area of about 3,000 square miles. In a follow-up search June 19 the Coast Guard scoured an additonal 18,000 square miles of the Pacific. Both searches turned up nothing, so the call from Dean was welcome.

According to Dean, he got a call via radio from Gerard, who said he had received a message from a ham on a distressed vessel. The *Grasse Matinee*, a 29-foot, home-built sailboat owned by Patrick and Susan Thomas of Woodinville, Washington had lost its mast in a storm.

When the Coast Guard got Dean's call they knew exactly which boat he was talking about. But they didn't know the boat's

positon or the condition of the crew. The Coast Guard asked Dean to contact Tahiti again and find out the color of the vessel and the type of radio gear on board. Dean and Gerard worked four hours on the air and were able to get not only the information requested, but they also learned that the boat had lost its rudder as well as its mast in the storm.

The Coast Guard called Dean again on Friday, June 19 to tell him that another Laguna Beach operator, Gregg, had made direct contact with the *Grasse Matinee*. Gregg was able to get the exact coordinates of the vessel for the Coast Guard. Mrs. Thomas then asked Gregg to call her mother. "I spoke with her mother," Gregg told the press, ". . . she was worried sick and not very optimistic." Even the Coast Guard assumed the boat had gone down. Gregg added that the couple said that with 70 gallons of drinking water and a two-month supply of food on board they had hoped to drift to Hawaii. Gregg added that while he kept Mrs. Thomas on the radio the Coast Guard was able to zero in on the exact location of the stranded boat. The Coast Guard cutter *Venturious* was sent to tow the *Grasse Matinee* into San Diego harbor.

By now you may have guessed the "twist" to the story that I mentioned earlier. While media accounts in the Los Angeles area referred to Dean, Gregg, and Gerard as "amateur radio operators, or hams," a call to Gordon West WB6NOA of Gordon West's Radio School showed this was not the case. Gordon is an avid recreational sailor and probably the most attuned person in the world to what's happening in personal radio on the high seas.

All three of the hero radio enthusiasts involved in the rescue are 10 1/2-meter HF operators, and all communication took place on 27.470 MHz and 27.800 MHz (just above the Class D CB channels and below the 10-meter amateur band). All quite legally since this was definitely an "Emergency Operation."

But here's the real zinger. Gordon only learned about this when he received a phone call from the pair of Laguna Beach radio enthuiasts asking how they could get their amateur radio licenses. West added that both are now enrolled in a ham radio training class.

By the time you read this, both of these radio heroes should be hams. The pair, who live not far from those of us who write the late shift from Los Angeles, have the right kind of stuff and will be darned good hams. ■

ATV

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CLUBS AND ATV: PART II

Last month we talked about ATV Clubs and the importance of having them; how they can be a major influence on developing fast-scan TV (and SSTV/FAX) in your area. I've received dozens of letters over the past few years concerning the pros and cons of clubs and the good they do for VHF/UHF activity (even a few about how detrimental they can become when *politics* enter in and the power shifts from the do-gooders, creators, and builders to the bitchers, moaners, and complainers).

All clubs have one thing in common, whether they're horse clubs, bowling clubs, gun clubs, or amateur radio clubs. They all have MEMBERS. With members come varied ideas, opinions, levels of volunteer activity, and (no matter how you try to prevent it) politics. I've dealt with several clubs: revived some that were dead or dying, created new ones, been a passive member in others, and held offices in still others. I can see both sides of the coin.

Constitutions and Bylaws

The most important document in any club is its constitution. Unfortunately, it is usually overlooked, neglected, taken from some other group or from a general sample, or provided by the ARRL. Most clubs, in the formation stage, don't recognize the problem of just what they want their constitution to say. A constitution can be made to read and to do anything the founding fathers want it to do.

We went through our local ATV club's constitution and bylaws recently. Back in 1979 when the club was "unofficially" formed, it was a real battle getting this piece of legislation created, agreed to, and passed. First, we asked everyone's opinions about what they thought it should contain (we got very little specific material). Second, I drew up the first draft and presented it at one of the quarterly meetings. It was shot full of holes. I then broadened it, added recommended changes, retyped it, and presented it at the next quarterly meeting. Again, no decision. Copies were then mailed to all members. A few months later, another meeting. I thought for sure we'd have a decision since everyone had had time to study it in great detail. More excuses (gee, I forgot all about it, etc.).

By now we had a bunch of new members and, of course, they had "new" ideas. Talk about frustration! (See Fig. 1 for an example of "frustrated ATVers.") I'd had about all I could take, so I asked for voluteers to take over the project. One member (the one who seemed to be the most critical of and the least help with club actions and projects) volunteered. I couldn't get the paperwork into his hands fast enough! A special meeting was scheduled that would deal only with the constitution and the bylaws.

The new chairman got a taste of his own medicine trying to conduct *this* meeting. He really lost his cool, however, when some of the legislation he'd suggested (and had tried to slip into previously approved paragraphs) was voted down. After nearly a year from the first presentation and a long, long marathon session, the constitution finally passed.

We were not unique. Most clubs go through this same process. The important point that we put in our constitution and bylaws what *we* wanted to see enacted and not a lot of generalizations written for other amateur radio clubs. Our constitution is a unique, amateur ATV-based piece of legislation. If you would like a copy, send me a SASE and I'll be happy to send one.

BUILD A REMOTE TRANSMITTER

One of the ways to generate new activity and interest in fast-scan UHF TV in your area is for your ATV group or club to undertake a remote transmitter project. These are easy to build and simple to interface, and the FCC has regulated the operation and control of such transmitters.

Of course, the first step in the project is to get a callsign from the FCC. Before starting construction on the project, identify a site with both physical access and access to power lines. Obviously, the higher the location the better. For actual construction of the project you will need a reliable one-Watt transmitter (P.C.'s KPA5, a TX70-1, or Wyman's new WR-1500, are ideal); power amplifiers for better coverage; a good, dependable Touchtone™ DTMF decoder system; a BNC or SO-239 multi-channel video switcher system, video feeds (computers, colorbars, cameras, packet, RTTY, TVRO, etc.) to the various channel feeds, and a built-in, 10-minute time-out unit.

WD0BCE of Davenport IA doesn't have any slow-scan TV gear in his shack, yet we have interfaced his ROBOT 400 converter into channel 7 of our fast-scan TV RT system. He watches ATV by piping the HF-toned SSTV signals over 2 meters and sends from a pre-made cassette. He even worked New Zealand late one night!

Our club's remote transmitter originally listed 10 channels of video TV feeds (see *73*, April 1986), but, recently we added a P5 color 910.25 MHz AM TV link (WB0BIZ ATV/R) that gave us ten more viewing channels for a total of 20. Our members don't know which MODE-A channel to select (computer games, align on test patterns, VCR replay, incoming weather radar, monitor cameras, etc.). A built-up system like this can add much of interest to the fast-scan TV mode in any area.

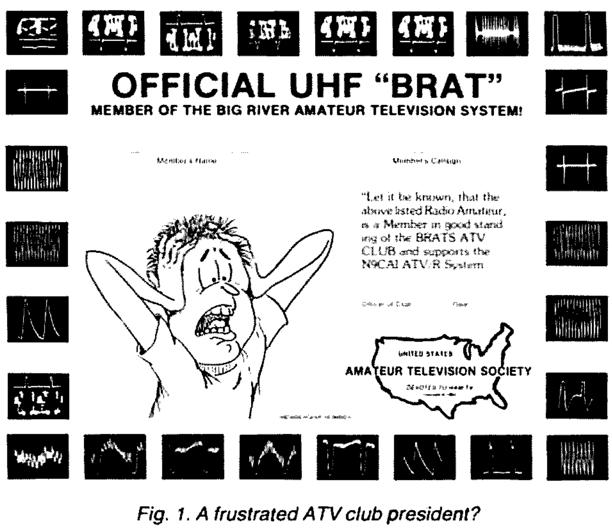

Fig. 1. A frustrated ATV club president?

FM-TV

FM amateur TV, big in England and other countries, is just getting started here in the United States. I've been part of some early FM testing involving color reception of FM.

There is a rumor current that reception of FM TV on a standard AM TV receiver is impossible. It is also rumored that sending on 70 cm is illegal. Neither rumor has any basis in fact. Although I recommend that wideband FM be used on 1200 MHz or above, narrowband (6–8 MHz) can be transmitted and received legally on standard TV sets at 439 MHz. By using slope detection and by correct tuning, you can display some pretty great black and white pictures. Wyman Research (RR #1, P.O. Box 95, Waldron IN 46182) is currently the only U.S. distributor and commercial researcher of FM ham-TV products.

Color tests with Merle Reynolds W9DNT (a 40-mile, P4-P5 simplex FM signal) demonstrated improved color on an AM TV set over that with the AM mode. Colors so rich and full of chroma you'd think there was somthing wrong with his AM mode. W9DNT's tests, conducted through an established AM ATV repeater, worked well as long as he slid his way above the center passband of the AM recieved signal slot. Future tests are planned with a true FM receiver. I expect even more significant results. Similar tests have been conducted by the Metrovision (Washington DC) and the Virginia ATV Group on higher frequencies.

The FM signal, however, runs the amplifiers a lot harder, so make sure to keep the fans on for proper cooling. Wattage just about doubles on the Bird.

ATV: GET INVOLVED

What happened this summer on ATV?

Bill Brown WB8ELK of the Findlay OH ATV group and half of the midwest watched *live* fast-scan TV pictures from a helium balloon at 100,000 feet.

Joe Muscanere WA5HNK of Pearland TX worked Charles "Red" Seals WA4GRK of St. Peterburg FL on 1289.0 MHz, a mere 746 miles (WA4GRK and W5VDS hold the American 70 cm FSTV DX distance record of 937 miles).

The sky was alive with ham TV this summer—aeronautical mobile TV operations from the west by W6UBI and N6HO; from the midwest by WA8VWY and KA8LWR.

Marty Fitzgerald WD0BCE, Davenport IA sent and received SSTV pictures on 14.230 MHz HF via a local FSTV repeater.

Henry Ruh KB9FO brought weather radar Touchtone™ callup to the Chicago ATV area.

Seventeen new ATV repeaters went on the air across the country this summer.

COMING EVENTS

NASA's SSTVer, Dr. Tony England W0ORE will be the guest speaker at two events: the Superfest, September 19–20 in Peoria IL and the Minnesota Hamfest and Computer Expo, October 31 at the Hennepin Technical Centers. Look for color SSTV from Pitcairn Island! ■

Photo A. Herb Hildebrand W6UBI and Jim Buckman N6HOS manning the 70 cm aeronautical mobile ATV system.

RTTY LOOP

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For the last few months I have been covering some of the hard and software on the cutting edge of RTTY technology, computer programs, and terminal interfaces. This month, I'd like to look at one section of information exchange that remains a standard mode of education, with a content that's right up our alley. The mode? BOOKS!

Two books have been reviewed here which address themselves to the amateur who uses digital communications; one to the novice, and the other to users ranging from beginner to expert. By their publication, they continue to speak to the vitality of this segment of our hobby. Let's have a look.

The Digital Novice

In his book, *The Digital Novice*, Jim Grubbs K9EI, gives us a lighthearted look at digital communications. With chapter headings like "The Digital Cave Dweller," and "Noah's ARQ—AMTOR," he sets the tone for a volume that is both educational and fun to read. Nicely drawn cartoon-type illustrations complement the text, and provide the insight often needed for sticky concepts.

The book itself is a 128-page paperback, in the familiar 8.5 by 5.5 inch size. The type is large enough to read comfortably, is clear, and has few typographical errors. If I have any criticism, it's that the lack of alternative typefaces, such as bold or italic, makes the text visually dead.

The beginning of the book harks back to a simpler age, when man lived in caves and counted with his fingers. Fingers—digits—the Digital Cave Dweller! From this humble beginning, Jim leads us through analog vs. digital values and the origins of the modern computer.

Morse code, with its on/off states, is a digital mode, too, and that fact is not overlooked in this book. It goes on, though, to build on the base that Sam built to show the basics of radioteletype communication. There is a cursory examination of baud rate, shift, and speeds.

An examination of ASCII is next, with a brief but meaningful tip of the hat to various forms of the code, and various modes of communication circuits. After a look at AMTOR, a little less than halfway into the book, the discussion turns to packet.

There is no way Jim can tell all there is to know about packet in a fifteen-page chapter, and he makes no pretense of doing that. What he does do is give a good, basic introduction to the topic, so that when someone mentions FCS or the like you won't just squint and say, "Huh?"

His look at personal computers is biased towards Commodore products, but is generally worthwhile. Interfaces are covered in three chapters that somewhat overlap, and seem to mention most of the current "hot" topics. A for-fun last chapter gazes into the future, and lets all of us blue-sky on what's to come.

After a few appendices and licensing information, Jim concludes with a "Final Test," a self-examination to help you appreciate what you learned—painlessly! You earn the Digital Novice certificate when you pass the test. *The Digital Novice* is a wonderful introduction to what many people consider a mystical mode of communication.

The Digital Novice, by Jim Grubbs K9EI, is published by QSKY Publishing, PO Box 3042, Springfield IL 62708, and sells for $9.95 plus $2.50 postage and handling.

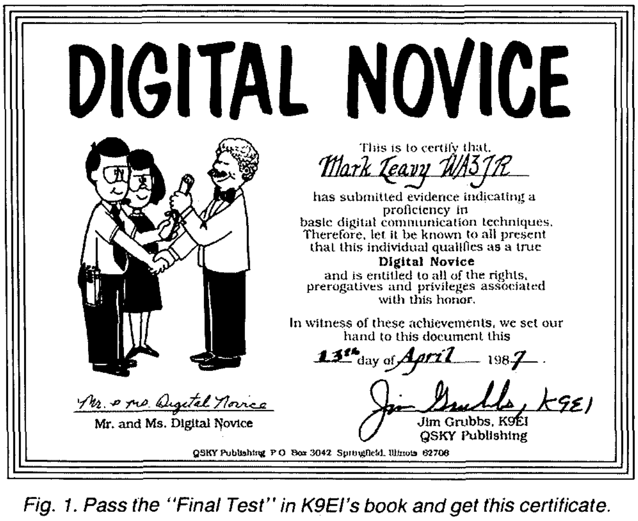

Fig. 1. Pass the "Final Test" in K9EI's book and get this certificate.

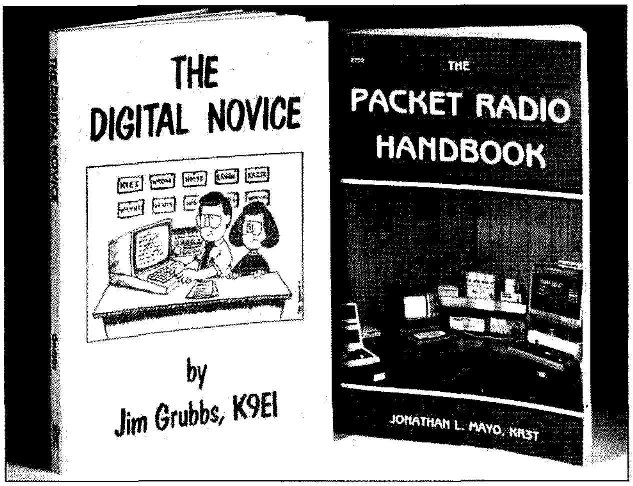

Photo 1. All you need to get started in digital communications . . .

The Packet Radio Handbook

Modestly titled *The Packet Radio Handbook*, our second book this month is written by Jonathan L. Mayo KR3T, and may well just live up to its title. This professionally-typeset paperback, a shade smaller than our previous entry, weighs in with 217 pages, and enough photographs and diagrams to satisfy any editorially-inclined individual.

Logically enough, the book begins with the question, "What Is Packet Radio?" In a comprehensive chapter, packet radio is explained in terms of a digital system, and other important aspects of digital communication are examined. There is also a brief look at integrated circuits and microcomputers.

Closer to home, the next chapter deals with packet radio in the Amateur Service. From the early history, the patterns which developed are looked at, and with that examination, some of the quizzical items often observed become clear.

A thorough description of the fabled Terminal Node Controller leads a chapter detailing hardware systems in the Amateur Service. Here we look at software TNCs vs. hardware TNCs, and all their varieties. If you have a packet signal, you need to communicate with another to make it go. A look at modulation techniques is covered as well.

Two stations are nice, but with three you get a network. Networking and other protocols are covered in great detail. Between gateways, layers, channels, and alphabet soup, it's all in there, and Jonathan does an admirable job of getting it to make sense.

Setting up a station is the next topic covered, and he covers it widely and objectively. The issues of choosing a terminal, TNC, and radio are all addressed, and there does not appear to be any overt bias toward this system or that. Some sample stations are pictured, ranging from a budget system on a shoestring to sharing a terminal with another microcomputer to setting up a portable station.

Of course, there's a chapter on operating practices. With photographs of various screen displays, all of the typical packet situations are covered in understandable language.

Covering available equipment is fraught with danger. The lead time of a magazine is bad enough; a book is far worse. I find myself thinking back to some of the books I used to state out in ham radio, some twenty-five years ago, and how dated the "modern" equipment pictured would look today, as I leaf through

the pages of current packet equipment in this chapter. Nonetheless, at the current time the overview is useful if for no other reason than to demonstrate the diversity of equipment available with so narrow a field as packet communication.

And, as if following some divine inspiration, this book as well ends with a look into the future of packet. I'll leave that reading to you.

If you run, think you'll run, or are just curious about, packet radio, you need this book. I know I had lots of questions before reading it. I still have lots of questions, but they are more intelligent ones!

The Packet Radio Handbook, by Jonathan L. Mayo KR3T, is published by TAB Books, Inc., Blue Ridge Summit, PA 17214, and sells for $14.95. It should be available any place TAB books are sold.

If you order either of these books, be sure to tell them that "RTTY Loop" keyed you in to their excellence!

About all of the mail lately has been directed at the CoCo programs published in June and July of this year. I hate to leak this, but more is on the way, for the CoCo and other computers as well. Just make sure your subscription is up to date.

"The Digital Novice *is a wonderful introduction to what many people consider a mystical mode of communication.*"

There have been plenty of other questions, though, and next month will see the old mail sack dumped out on the desk, rummaged through, and spread out for you all to see. As always, I remain available for your comments and questions by mail, Compuserve (75036,2501), or Delphi (MARCWA3AJR). I try to keep up with you all, especially the great number of you who tell me that when you get your issue of *73*, the first place you turn is right here—to RTTY Loop!■

NK6K > PACKET

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Packet Countries List

The following countries are known to be active on Packet. Additional information is solicited. This information has been obtained from WØRLI, WD4BIW, W9ZRX, N1DL, DU1POL, KB7G, K2AAA, AD8I, HK3BCA, W3IWI, WD9DHI, WA6OWM, WB7DCH, N6IYA, VK4AHD, WA6OWM, W7LHO. As of 07/12/87, the list contains 78 countries.

3D6,	4X,	5H3,	5N,	5V,	6W,	9K2,	9M,
9V,	A4,	BY,	BV,	CE,	CN8,	CP,	CT1,
C6,	DL,	DU,	EA1,	EA8,	EI,	F,	FM,
G,	GI,	GJ,	GM,	GU,	GW,	HA,	HB,
HC,	HH,	HI,	HK,	HL,	HP,	HT,	I,
JA,	KHØ,	KH6,	KG4,	KL7,	KP4,	LA,	LU,
LX,	OE,	OH,	ON,	OX,	OY,	OZ,	PA,
PJ,	PY,	SM,	ST,	TG,	TI,	TF,	T3Ø,
VE,	VK,	VP2M,	VS6,	W,	XE,	YB,	YJ,
YU,	YV,	ZF,	ZK1,	ZL,	ZS		

I'm not getting much input from the field these days. This may be just summer inactivity, or it may be that the newness of packet is wearing off. In any case, I'm going to spend part of this month and the next saying bad things about packet; maybe the change of pace will stir up some activity.

The Ollie North Show.

Lt. Colonel Oliver North has been testifying during the preparation of this column. Aside from the obvious, several things can be learned from the hearings. Here in Los Angeles, we're getting simultaneous live coverage on ABC, CBS, NBC, PBS, and CNN. Since the video is a pooled source, (everyone taps off of the same set of cameras), the coverage is just about identical on those five stations; except when the anchors justify their salaries by talking over the audio. That's when you need a fast finger on the remote control, to find a channel where the anchor has slipped out for a trip down the hall. The best part of the hearings comes during transitions, where one committee member takes over from another one, e.g., "Well, those of us who passed their bar the first time know..."

In fact, even with identical coverage, some networks manage to bring the news to me quicker. Since I'm radio-oriented (and procrastinating like mad), I compared the various networks and found that PBS beats all the competition by about 250 milliseconds. The local PBS outlet (KCET) either gets the video direct from terrestrial microwave, or they're taking one less satellite hop. ABC and NBC tie for second, CBS and CNN are a close third.

The HF STA

Last month, I included the text of a request to the FCC for Special Temporary Authorization to allow HF stations to run fully automated and unattended. Although the text of the approval by the FCC was not available in time for this column, Dave Toth VE3GYQ reports that the FCC has granted the STA as requested by the ARRL. The STA starts on July 7 and runs for 180 days. The ARRL can add more stations to the STA simply by sending names and addresses to the FCC. Although a long time in getting to the FCC, they approved it in short order, and things are on track.

International Packet

A copy of some IARU (International Amateur Radio Union) resolutions was enclosed in a recent mailing from the ARRL to members of the Digital Committee. The IARU is a collection of national amateur radio associations; the ARRL being a member. The IARU has an administrative council, which is a sort of executive committee that meets regularly and makes recommendations to the IARU as a whole. There have been several resolutions from the IARU and from the Council that relate to packet in recent years. The examples below give you the feeling that not everyone looks forward to continued exponential growth of packet, particularly on the HF bands.

"... the ultimate result of the HF STA might be the creation of a new 'automatic unattended digital subband', it need not overlap the current 'RTTY' subband, and need not be limited to one 300-baud 200-Hz shift frequency."

"Resolution 87-2, concerning the relaying of messages by amateur stations; The IARU Administrative Council, Noordwijkerhout, April 1987.

Recognizing: the problems caused by the handling by amateur stations of communications having inappropriate content, particularly with regard to business and commercial matters,

Recognizing: the impact on other users of the crowded HF spectrum from unattended store-and-forward ("mailbox") stations, and

Further Recognizing: that the problem of controlling the content of amateur radio communication is made more difficult by the availability of such stations,

Resolves: that the Administrative Council affirms the action taken at its Buenos Aires meeting, in urging member-societies to emphasize to their members the importance of adhering to the spirit and intentions of the ITU Radio Regulations, and of handling only that traffic which does conform; and

Further resolves: that member-societies are hereby urged to acquaint their members as to the undesirable aspects of the uncontrolled proliferation of unattended HF store-and-forward ("mailbox") stations."

The action at the Buenos Aires meeting referred to above included Resolution 86-2. This resolution congratulated amateurs for developmental work in packet radio, but went on to make some recommendations, which are excerpted below:

(86-2 resolves...)

2) that member societies are urged to encourage amateurs in their countries to confine routine HF packet operations to the segments of the bands designated for RTTY and similar modes;

3) that developmental work that takes place outside the RTTY subbands should be confined to one frequency per band, with the frequency to be designated by the International Secretariat for International Communications after consultation with the regional organizations, and by the member-societies for domestic communications after due consideration of regional band plans, international and domestic regulations, and the desirability of minimizing interference to stations using other modes of emission;...

As you can see from the above, the IARU would prefer that HF packet stay in the RTTY subbands, and that anything else, such as the STA network, be limited to one frequency per band. Unfortunately, this is in variance with current conventions, at least as practiced in many parts of the world on 20 meters. I bring this up because these resolutions were one of the major stumbling blocks to getting the ARRL to submit the HF STA in the first place; many of the prospective participants wanted more than one frequency on 20 meters. The final STA was a compromise; the ARRL dropped a limitation on the number of participants, the HF crew settled for one frequency per band for the STA.

While I think that the ultimate result of the HF STA might be the creation of a new "automatic unattended digital subband", it need not overlap the current "RTTY" subband, and need not

be limited to one 300-baud 200-Hz shift frequency. I'd like to get your comments, and, more importantly, your *ARRL director* needs to hear your comments. More on this topic in the future.

International Packet Numbers

A survey commissioned by the IARU in 1985 was delivered at the April 1987 meeting. The report includes estimates of packet users, mailboxes, and digipeaters for European countries. The percent of packeteers in the amateur population ranges from a low of 1.3% in the UK to a high of 8–10% in France and Belgium. The UK reports a annual growth of 300%, so expect bigger numbers there next year. The U.S. estimate is 5% with a 100% annual growth. The US reported 380 mailboxes, most other countries reported 5–10, and the UK had 24. Several reported that a separate license was required to run a BBS. Where digipeating is legal, none of the European countries regard digipeated packets as "third party." This list includes Austria, Belgium, France, Hungary, the UK, Italy, Norway, Poland, and Sweden. In the U.S., strict interpretation of the rules do regard digipeaters as third-party traffic generators. This was one of the reasons for the waiver to the FCC 85-105 proceeding discussed in past columns.

ARRL Packet-Radio Conference

The Sixth ARRL Amateur Radio Networking Conference will be hosted by the TRW Amateur Radio Club and the Southern California Digital Communications Council. The conference will be held at the TRW Space and Technology facility located on Compton Boulevard (between Freeman Avenue and Aviation Boulevard), Redondo Beach CA, on Saturday, August 29, from 9 a.m. to 6 p.m.

The actual site is the TRW cafeteria just south of the white high-rise TRW administration building. A separate dining room will be set up for demonstrations. Demonstrators will be allowed to enter the facility at 8 a.m. for set-up. A beginner's presentation will be given at 9 a.m. The main conference will start at 10 a.m. The talk-in frequency is the W6TRW repeater, 145.32 kHz, with a -600 kHz input.

The TRW ARC swap meet will be located about 1/4 mile from the main cafeteria, and personnel will be on hand for directions. The swap meet starts at 7 a.m., and runs through the morning. There are usually 300–400 sellers at this event. There are no commercial food establishments within walking distance; numerous eateries are within a short drive. Consider bringing a box lunch.

The official hotel for this year's conference is the Torrance Marriott, 3635 Fashion Way, Torrance CA; for reservations phone (213) 316-3636. Say you're going to the Computer Networking Conference and receive the special rate of $55.00 (per night/double occupancy).

The high-rise TRW building and the area near the cafeteria was the background for a scene on the planet Deneva in the Star Trek episode *Operation Annihilate*. This is just one of the "only in LA" features, so make an extra effort to attend.

You are invited to announce your intent to attend by sending a message to NK6K @ NK6K on packet, or to 71635,1174 on Compuserve.

The ARRL Digital Communications Committee will meet on Sunday, August 30, at the Torrance Marriott, and further details will be available at the Saturday conference.

See you at the conference!■

"The HF STA (Special Temporary Authorization) starts on July 7 and runs for 180 days. The ARRL can add more stations to the STA simply by sending names and addresses to the FCC."

HAMSATS

Andy MacAllister WA5ZIB
2310 Romayor Court
Pearland TX 77581

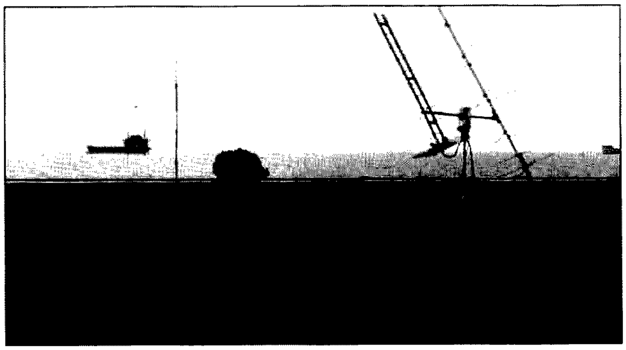

Photo A. Satellite antennas for a Field Day near Galveston, Texas. An ocean view with a vertical for RS reception, a helix for 70 cm, and a 14-element, crossed yagi on two meters.

NEW SOVIET HAMSATS

They're up! On June 23rd, RS-10 and RS-11 became our newest amateur radio satellites. They and the primary payload, COSMOS 1861, appear to be doing well. Thanks to the efforts of many launch-watchers and amateur satellite enthusiasts around the world, information concerning RS-10 and RS-11 was available within just a day or two after launch. We are still learning more details about their operation and use through monitoring and from Russian publications.

RS-10, RS-11, and COSMOS 1861 are actually all on the same spacecraft and presumably are sharing the same power system. The Soviet news agency, TASS, said COSMOS 1861 is intended to work within the space navigational system to determine the position of the USSR's sea-going vessels and fishing fleets anywhere in the world. The system resembles the U.S. NAVSTAR Global Positioning System.

The navigational abilities of COSMOS 1861 might be used by UA3CR during the joint USSR-Canadian Polar Expedition next winter.

So What's Up?

A chart of proposed RS-10 frequencies appeared in the March, 1987, HAMSAT column. Although the bands presented for each satellite mode were correct, the exact frequencies used are considerably different. Fig. 1 is a list of the new frequencies for the RS-10/11 combination. Modes A, K, and T have all been operational, and the ROBOT auto transponders have logged many contacts since launch.

Mode A is the standard two meters up and ten meters down that we've been familiar with since AMSAT-OSCAR-6. The RS 10/11 mode A transponders are non-inverting. If you transmit a signal high in the uplink passband using upper sideband, you will come out high in the downlink passband with upper sideband.

The transponders are also very sensitive. Some stations have been able to achieve reliable sideband contacts using only ten Watts to a Ringo Ranger omnidirectional, two-meter antenna. This was not always the case with the previous group of RS satellites.

Mode K was unsuccessful on previous ISKRA satellites from the Soviet Union. Mode K uses 15 meters up and ten meters down. Like Mode A, it is non-inverting and sensitive. On several occasions I have heard stations in the RS-11 downlink passband who had no idea they were being heard via satellite. They were using standard E- or F-layer propagation for their shortwave QSOs, but also were being re-transmitted through the satellite's ten-meter downlink.

For the uplink on 15 meters, about 100 Watts to a vertical should be sufficient. Some satellite chasers using three- and four-element beams have had success using as little as five Watts.

When using mode K on either RS-10 or RS-11, there are interesting limitations due to HF subband allocations. The RS-10 uplink extends from 21.16 to 21.20 MHz. In the U.S., this frequency range may be used by any class licensee including Novices. Maximum power output cannot exceed 200 Watts and only CW can be transmitted. For RS-11, with a mode-K uplink of 21.21 to 21.25 MHz, the rules are very different. Only Extra class hams can use the segment from 21.21 to 21.225 MHz. From 21.225 to 21.25 MHz, Advanced class amateurs can join the Extras. Single sideband can be used on RS-11 if you have the appropriate license. Don't let sloppy operating procedures find you running voice in the Novice band or anything in the Extra band if you don't have the license to match.

Mode T makes its debut with the RS-10/11 combo. Although 15 meters up and two meters down may sound absurd, it does work. Like mode K, the 15-meter uplink frequencies have their particular license-oriented restrictions.

ROBOT, or autotransponder, operation via RS10/11 has been similar to RS-5 and RS-7, but with a few curious differences. While listening to the RS-10 ROBOT on 29.403 MHz, pay attention to what it is transmitting. If it is calling CQ and sending "QSU 21120 KHZ", then it will be listening only on the 15 meter uplink. If it hears nothing, then it will call CQ again in about 45 seconds and announce a new uplink frequency of 145.82 MHz. It cannot monitor both uplinks simultaneously, but will alternate between the two and will spend the most time monitoring the more active frequency.

To make contact with the RS-10 ROBOT use the following sequence with your call inserted appropriately: RS10 DE WA5ZIB AR. The "AR" at the end must be a continuous dit-dah-dit-dah-dit, otherwise RS-10 will completely ignore the transmission. I have tried code speeds from ten to 50 words per minute. Best results have been around 25 wpm using a keyboard CW generator. The RS-11 ROBOT works in a similar fashion but with different frequencies. Check the discussion of ROBOT operation in the July HAMSATS column for more details.

The orbit of RS-10/11 has a period of 105 minutes, which gives it an altitude of about 1000 kilometers. This is slightly higher than AMSAT-OSCAR-8's orbit, but lower than AMSAT-OSCAR-7 and previous RS satellites.

*** RS-10 ***			*** RS-11 ***		
Mode	Uplink Band	Downlink Band	Mode	Uplink Band	Downlink Band
K	21.16-21.20	29.36-29.40	K	21.21-21.25	29.41-29.45
T	21.16-21.20	145.86-145.90	T	21.21-21.25	145.91-145.95
A	145.86-145.90	29.36-29.40	A	145.91-145.95	29.41-29.45
KT	21.16-21.20	29.36-29.40 145.86-145.90	KT	21.21-21.25	29.41-29.45 145.91-145.95
KA	21.16-21.20 145.86-145.90	29.36-29.40	KA	21.21-21.25 145.91-145.95	29.41-29.45

Beacons:
29.357, 29.403, 145.857, 145.903   29.407, 29.453, 145.907, 145.953

Robots (autotransponders):
21.12 and 145.82 up, 29.403 down   21.13 and 145.83 up, 29.453 down

Fig. 1. Frequency plan for R-10/11.

Fig. 2 shows an "element set" that will allow you to update your tracking program for RS-10/11. This set will be good for a few months at least, due to the stability of the orbit. Check the AMSAT nets for updates.

For modes A and T we can expect excellent coverage of North America, while those in the northeast will have access to Europe on appropriate passes. Satellite chasers to the west can expect good access to Alaska and Hawaii.

For DX work, mode K may provide some exciting surprises. Since two shortwave bands are used for both the uplink and downlink frequencies, line of sight isn't the only propagation mode that can be used to make contacts through the satellites. When conditions are right for long distance F-layer propagation on ten meters, the same will likely be true for 15. If RS-10 or RS-11 is in mode K, and you can hear the ten-meter downlink, you can probably make contact through the transponder regardless of the satellites' location. We will be hearing of many new DX records via low-earth-orbit satellites while RS-10 and RS-11 are in the sky.

The RS-10/11 integrated system of transponders and ROBOTs is part of a package called BRTK, which stands for "Equipment for Radio Amateur Satellite Communication." It was built at the Tsiolkovskiy State Museum of the History of Cosmonautics in Kaluga, USSR. It is likely that the mode designations K and T stand for Kaluga and Tsiolkovskiy.

The team responsible for our latest Hamsats was headed by Aleksandr Papkov and Viktor Samkov. Papkov began his satellite construction activities by building the telemetry systems for RS-1 and RS-2. These satellites were launched in 1978. Garbled telemetry can still be heard occasionally from RS-1 on 29.401 when the satellite is in sunlight. Papkov's organization has been responsible for several RS and ISKRA spacecraft.

No details have been available concerning RS-9. It has probably been shelved pending a future launch.

BBS in Orbit

The long-awaited Japanese Packet bulletin board in space became available for general use above the U.S. on June 21st. Details of its operation can be found in the Packet column and HAMSATS column in the July issue of *73*.

WB5IPM and VE3JF were the first in North America to connect to 8J1JAS on board Fuji-OSCAR-12 and leave messages in the system. G3RUH, designer of the most widely-used F-O-12 modems, was the first non-Japanese station to work the BBS. Fig. 3 presents an example of what you might see on a typical F-O-12 mode JD BBS pass.

While the satellite is running BBS software, it will not act as a digipeater. It will support access from more than one station at a time, but operations are slowed by heavy loads. Although the early versions of the on-board software can store only 50 messages, the list of users is impressive, with callsigns from all over the world.

Due to schedule constraints of the JAMSAT engineers, F-O-12 was not available for mode JA, the analog mode, during Field Day. Although this disappointed many would-be users here in the States, it provided needed BBS air time for software tests. BBS and experiment days will likely occur on weekends, while recharge- and mode-JA operation will be scheduled during the weekdays.

Field Day

Even without mode JA, satellite operation was much better in '87 than in '86. If any of you set up for F-O-12 mode JD at a remote Field Day site, I'd like to know about it! It is one thing to get a satellite station together or a Packet station on line, but mode JD is just a bit much for a trip to the woods.

AMSAT-OSCAR-10 provided great DX along with many stateside contacts. RS-10 and 11 were available for use even though they had been in orbit only four days.

A typical Field Day satellite station shouldn't be very complex. Ours included a home-brew, ten-turn helix for 435 MHz and a 14-element crossed yagi for 145 MHz. The antennas were mounted just high enough to clear the ground by a few feet when aimed at high elevation angles. For the RS ten-meter downlink, a simple ground-mounted vertical with a MOSFET preamp provided ample signal levels for easy listening. The new RS transponders have five-Watt outputs and are quite loud.

Our radios included a Yaesu FT-726R with a two-meter GaAsFET preamplifier for A-O-10, and an old HF rig for RS reception. We had an ICOM IC-271A and IC-471A at the site, but Murphy got into them while I wasn't watching.

Even taking into account the difficulties, this year's Field Day was one of the best for satellite enthusiasts. With Phase 3C scheduled for launch early next year, Field Day 1988 could be even better.

Updates

A few notes on general satellite activities are in order before I head back to the shack:

•RS-5 and RS-7 will have little or no eclipsing in August or the first days of September. If there is any life left in these veteran spacecraft, we'll find out then.

•A-O-10 will be experiencing poor sun angles toward the end of August. It will once again enter a period of hibernation in September and October. Check the AMSAT nets and publications for schedule changes.

•F-O-12 BBS experiments will continue, but I am expecting a stable schedule of modes JA, JD, and D (recharge) soon. We have hoped for a schedule for almost a year. With the success of recent BBS efforts, perhaps the right time has arrived.

•RS-10 and RS-11 are likely to have a schedule we can report here next month. Modes A, K, and T via the new Soviet HAMSAT/COSMOS combo has exciting possibilities. Give them a try! ■

Object:	18129
Int'l Designation:	87-54A
Element Set:	15
Ref. Epoch (Year):	87
Ref. Epoch (Day):	180.79529985
Inclination:	82.9228
R.A.A.N:	48.7368
Eccentricity:	0.0010305
Argument of Perigee:	244.6637
Mean Anomaly:	115.3451
Mean Motion:	13.71864092
Decay	6E-08
Ref. Orbit:	89

Fig. 2. Kelperian element set for RS-10/11 (COSMOS 1861).

```
8J1JAS>WA5ZIB:FO-12/JAS-1 Mailbox ver. 1.01
Use H command for Help

8J1JAB>WA5ZIB:JAS>
8J1JAS>WA5ZIB:++ Available commands ++

F     : List latest 10 file headers
F*    : List all file headers
H     : Show this message
K<n>  : Kill a file numbered <n>
R<n>  : Read a file numbered <n>
W     : Write a file

8J1JAS>BEACON:JAS-1 RA 87/07/04 22:40:58
238 563 657 661 713 876 887 862 003 320
647 002 601 628 634 631 635 634 687 001
704 690 703 704 669 676 925 751 000 000
010 111 100 000 100 000 001 111 111 000

8J1JAS>BEACON:JAS-1 M0 87/07/04 22:41:00
Mailbox available.
Software loaded at 87/07/04 01:20:00
Mode JD Transmitter will be toggled ON/OFF
every two hours using this epoch.

8J1JAS>WB7QKK:
NO.   DATE   UTC     FROM     TO      SUBJECT
036   07/04  13:49   VK3DTO   VK5ZK   HI
035   07/04  13:46   VK5ZK    DH4KAH  Reply
034   07/04  10:59   I0JX     IK0CAK  CONGRATS

8J1JAS>WA4EJR:TO?
8J1JAB>WA4EJR:SUBJECT?
8J1JAS>WA4EJR:Enter text, <CR>.<CR> to end.
8J1JAS>WA4EJR:END

8J1JAS>WB7QKK:
009   07/04  18:37   WB5IPM   KA9LNV  PSK REPLY
ED.. DONT GIVE UP ON PSK NOW!!

8J1JAS>WA4EJR:JAS>
8J1JAS>WA4EJR:
016   07/04  21:36   ZS6IT    ALL     Gateway to SA
015   07/04  21:32   ZS6IT    ALL     Valve needed ur
014   07/04  18:52   WA5ZIB   ALL     FINALLY!

8J1JAS>WB7QKK:014  07/04 18:52  WA5ZIB  ALL     FINALLY!
IT TOOK A WHILE, BUT I FINALLY GOT THE BUGS OUT HERE! 73!
```

Fig. 3. A sample of F-O-12 BBS activity.

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FOR SALE: JVC MODEL KV350 3/4-inch reel to reel video recorder. New, never used. Serial number supplied upon request. $500. Jerry Lehman, 20 North 16, Terre Haute IN 47802 (812) 232-2024. BNB600

ALUMNI OF LOUISIANA STATE UNIVERSITY, please write Doug Hensley WJ5J, 5054 Holloway Avenue, Baton Rouge LA 70808. BNB601

MINI AMORPHOUS SOLAR MODULES work in roomlight! Use as micro power supply, small battery charger, sensor. Convert battery calculator to light, maintain memory batteries. 1 1/2-V size: 9μA indirect roomlight to 5.75 mA direct sunlight. 3-V size: 10μA indirect roomlight to 3-1/2 mA direct sunlight. Wholesale cost: $1.05 each 1-1/2-V size and $1.75 each 3-V size plus $1 flat shipping charge. Frank Alexander K6UUU, 540 Discovery Bay Blvd., Byron CA 94514. BNB602

GL-500 SSB WITH POWER SUPPLY, mike, swr bridge HK AM-2. Original box with manuals $150.00. Shipping *not included. Bruce* B. Adams W1UPB, 66 Lakeview Road, Lincoln RI 02865. BNB603

HJ-4 COLLINS IN TABLE TOP RACK AND PANEL—Excellent Condition—Crystal Filter General Coverage. $150.00. Shipping not included. Bruce B. Adams W1UPB, 66 Lakeview Road, Lincoln RI 02865. BNB604

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Drake, Swan, Heath, and all others. Six 1/2-inch digits. 5-inch wide by 1 1/4-inch metal cabinet. Send $2.00 for information. Receive a $30.00 discount. Includes accuracy comparisons of the simple "BCD" and offset (May 73) readouts, found in new radios, against our "Calculating Frequency Counter" readouts. Please be specific. GRAND SYSTEMS, PO Box 3377, Dept. A, Blaine WA 98230. BNB605

EASY CODE FROM THE OLD MASTER. Beginner's 90-minute learning tape $10. 60-minute practice tapes, any speed $8. Specify. The Old Master, Box 29013, Atlanta GA 30359. BNB606

TUBE SALE. New, Used, Old, Current, 25¢ and up. File ad or send list for quote. Ted Youngman, 2225 Vigo St., Lake Station IN 46405. BNB607

COMMODORE 128/64 OWNERS—Pass your Code Exam! Novice through Extra. Random QSOs, Random Groups. More Ham Programs Available. 12-Volt power supplies for VIC-20, C-64, C-128, and IIc. 12-Volt Monitors. Send for free flyer. THE PEGASUS PROJECT, PO Box 10079, Fairbanks AK 99710. BNB608

BEAM HEADINGS, YOUR QTH to 500 locations. In protective covers suitable for binder. $5.00. NW2J, 1529 Sunset Road, Castleton NY 12033. BNB609

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We are happy to provide Ham Help listings free, on a space-available basis. To make our job easier and to insure your listing is correct, please type or print your request clearly on a full (8 1/2 x 11) sheet of paper. Double-space and use upper and lower case letters where appropriate. Also, write numbers carefully—a 1, for example, can be read as an l or an i or a 7 as a 1. Thanks for your cooperation.

Can anyone help me with paperwork for any of the following pieces of equipment: Standard Signal Generator model 560FM, Tempo model MR-2 FM receiver, Hallicrafters model CSB-30-2 VHF (high-band) transceiver, Intech "Mariner" model V-108 marine VHF transceiver, Knight International model 333 FM stereo receiver, Hewlett-Packard model 410B VTVM, International Crystal "Executive" model 1500 CB, and Realistic model DX-160B receiver?

Anything from a schematic to a complete manual for any of these items will be greatly appreciated. I'll reimburse mailing and copying costs. I have access to a high-quality copying machine if you want to send original documents, which I'll return immediately.

Gary Trustle WB8SPV
424 Franklin Avenue
Waverly OH 45690

I'm looking for improvement modifications for the Drake TR4-C and Swan 500. Any users groups still active?

Wayne Elfstrom WB2NIE
76 Waterworks Road
Freehold NJ 07728

I need an owner's manual for a Clegg Mark 3 two-meter transceiver. I'll gladly pay copy and postage expenses so I can get mine repaired.

John Kuempel W8IXF
10 Garden Place
Cincinnati OH 45208

I need a copy of the parts list and schematic diagram for a Gillaspie model 9600 satellite receiver. I will pay for reasonable copying charges.

Jack Davis KB0GX
810 N. 13th Street
Bismarck ND 58501

I am looking for an owner's manual (or a copy) for a Hallicrafters SX-100 receiver. I'll pay any charges involved.

William Pence
800 Old Stage Road
Cave Junction OR 97523

I need a schematic and/or manual for a Regency model HR-2A 2-meter transceiver. Will pay any copying and postage costs involved.

Eric Johnson KB6EPO
799 Ada Street
Chula Vista CA 92001-2603

I'm looking for a digital frequency display, preferably a Heathkit SB-650 or any other make for my Heathkit SB-401 and SB-303 rig.

Dave Adams KA1MMC
15 Woodridge Road
Durham NH 03824

I need a copy of the manual and schematic for an RCA oscilloscope, model WO-78A. I will pay for copying and postage, or I will copy and return your original and all costs for postage.

Joseph Ruk W6ZHK
1145 Elmwood Drive
Millbrae CA 94030

We desperately need the power transistor for a GTX-1T VHF handheld radio set by Genave, serial #1624. The description of the part needed is NPN/RFP MRF 227 (Motorola), or RF2067. Your help would be greatly appreciated. Thanking you in advance.

Mahmoud Idera-Abdullah
EL2CE
C/O A.I.M.
PO Box 4262
Monrovia, Liberia
West Africa

Need owners manual and service manual for Radio Shack DX-300 receiver, also Archer Dual Analog Delay I.C. SAD–1024A (276-1761). Any reasonable price paid.

Robert Koczera W1BN
PO Box 1584
Providence RI 02901

73 INTERNATIONAL

NOTES FROM FN42

It is perfectly appropriate for the 73 International column to emphasize September 17 as a day to remember, because the U.S. Constitution, signed in Philadelphia 200 years ago this date, has had influence on the forms and contents of the constitutions of countries all around the world. Also, considerable source material for the Constitution came from other lands: the British (unwritten) constitution, English common law, the Magna Carta, Germany, Italy (some old papal bulls), and ancient Greece, to name just a few. Many of our Founding Fathers had classical educations.

We share September celebrations of national beginnings with 12 countries with Independence Days (plus Botswana's "Botswana Day," and that's what that is—it dropped its old name, Bechuanaland, in 1966) and 5 National Days. The twelve: 3—Qatar, 7—Brazil, 15—Guatemala, El Salvador, Costa Rica, Honduras, Nicaragua, 16—Chile, 21—Belize, and 22—Mali. The five: 10—Belize, 11—Chile, 22—Lebanon, 23—Saudi Arabia, and 23—South Yemen.

The 7th is Labor Day (U.S.), Labour Day (Canada); the 8th is World Literacy Day (hams can help reduce illiteracy, which so severely handicaps too many people); Bulgaria ended its Monarchy on the 9th (1946), and Japan has its Respect for the Aged Day on the 15th.

The 21st is Federal Thanksgiving Day in Switzerland, the 24th is Third Republic Day, Ghana, the 25th is Referendum Day in the land of the headwaters of the Nile, Rwanda, and it is Confucius Day in Taiwan on the 28th.

ROUNDUP

Cyprus. No word on whether C4LWF will be activated for the "Limassol Wine Festival" during the first fortnight of every September, "but since it has been established as an annual event" since 1961, the odds seem favorable. See the Roundup section of this column for January, 1987, for a bit more information.

Finland. The 29th Scandinavian Activity Contest is 1500 UTC on the 19th (of September) to 1800 UTC on the 20th, for CW, and September 26 to 27th (same hours) for phone. It is "To encourage...amateurs to work each other and to promote communication skills between amateur stations worldwide. Non-Scandinavian stations will try to work as many Scandinavian stations as possible." Also for SWLs. Eligible prefixes: LA/LB/LG/LJ, JW, JX, OF/OG/OH/OI/OHØ/OHØM/OX/OY/OZ, SJ/SK/SL/SM, and TF. Details from your local club.

China. Chang Han Dong has replied to questions asked him by the International Editor, who recently wrote in this column, Chang Han Dong writes...."It would have been proper to say 'Han Dong writes,' " since Chang is the family name, or in his case, "Xiao Chang writes," meaning young Chang. Thanks to Xiao Chang from Lao Editor (Old Editor)....He also explained about BY1PK: This station began *again* in the 1980s. (It was "the resurrection of BY1PK [which] marked a new Spring in Chinese amateur station" activity.) Some stations existed before 1949, some were on the air in the 60s, but there was little activity and most of it was with eastern European stations. Han Dong was appreciative of the question and the "carefulness and friendliness" of the questioner. Thanks to Sil Marini WPE4IIO (SWL) who was the one who first raised it. He has a BY1PK QSL dated 2/12/64.

Israel. 4Z4MQ of IRAC's 40th Year Committee (PO Box 4099, Tel Aviv, Israel) will welcome suggestions for the celebration of the Club's 40th anniversary. (Tselil Harmoni, quoted in *Westlink Report* #499)

Europe. Also from that *Westlink Report*: Lots more 6-meter DX is coming. In Great Britain, the 50- and 70-MHz bands are becoming available to UK Class B licensees, and the 50-MHz UK allocation expands to 50.0 to 52.0. Also expanded: Region 1 70-MHz band, to 70.0 to 70.5 in Great Britain. Ireland and Gibraltar amateurs have this band, Cyprus may, soon. 6 meters is coming to life in Ireland, with 9 stations authorized; 11 more permits are pending for 50 MHz. Some 6-meter operation now permitted by Gibraltar, Greenland, Iceland, Norway, and Spain; possibly coming: from Malta, Cyprus, West Germany, and Yugoslavia. (RSGB, GB2RS News Service, G8AUU)

U.S.S.R. Russians were "the earliest to grasp the possibilities of short-wave broadcasting," according to a four-page report on "World Broadcasting" in *The Economist* for June 6, and was among the most prolific of the 31 countries now engaged in external broadcasting. The Soviet Union also has stopped jamming the Voice of America. Surveys have shown that what listeners everywhere want most is fast and accurate news. A poll of Eastern Europeans, taken while they were away from home, showed that 45% of them had heard of the Chernobyl disaster from external broadcasts, 24% from newspapers, and 24% by word of mouth.

Kenya. At least two hams in Nairobi read *73*. 5Z4BP, interested in the DX Dynasty Award, calls us an "excellent publication." Thanks! Write us some news of your area for this column—please not in the official language of Kenya (Swahili) unless you translate it also. We'll make note of your Independence Day in the December issue. How is the planning coming along for the AFBC (African Broadcasting) of TV? (Nairobi hosted 190 delegates from 49 countries almost a year ago to discuss this.) TV's potential for teaching young and old in any area you can think of is enormous. Evening schools for adults in rural areas of the Ivory Coast, for example, have been credited with bringing improvements in health care and agricultural techniques. *World Press Review* reported in January that some viewers walked 62 miles to watch programs.

AUSTRALIA

Jim Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

A CORRESPONDENT'S REPLY

Being one of the original contributors to this column, I was

pleased to see a note by the International Editor (March, 1987, issue) reminding readers to send IRCs to cover return postage if information is requested from the correspondents. I would like to add to this.

Since Australia is classed as "the flavour of the month" in America at present, I have probably had more than my share of request letters over the last four years. This, I don't mind, but as a person who works six days per week, it does not leave me much time for amateur radio, let alone to chase up some requests.

Like the gentleman [*The Editor questions that description*] who sent an eight-page letter with 10 questions, some broken into two or three parts, so, in total, 20 questions to be answered. Since most were centered on an area 1,000 miles north of my QTH, my reply involved several interstate letters plus phone calls, and plenty of time.

That was probably the worst request I have received, but others were not far behind. However, the thing that really upsets me most are the requests for articles to be sent—at my expense—books, magazines, local amateur radio publications, tourist information, etc.

A typical example was when the special amateur radio envelope was published in Australia. I publicized this fact in my column...and I am still waiting, after several years, for many reimbursements for the envelope plus overseas postage. Airmail to the U.S. is $A0.90 (letters), and books cost from $A2 to $A20 plus postage, so perhaps you can understand why requests like that now go right into the wastebasket if there is no SASE included so that I can inform them of the cost of the item and the postage required.

. . . and phone calls. It's not all bad . . . occasionally you get a laugh, like one Sunday evening, sitting down to enjoy a roast dinner, I heard the phone ring. "This is W5—. I am just reading your article and thought I'd give you a call."

Into the oven goes my once-a-week roast dinner.

After preliminary discussion about the article, the gentleman [*Well, maybe this one was—Ed.*] discloses that it is 2 a.m. at his QTH and he is sitting on—that is, er, he is calling from, his toilet! After a 35-minute conversation I was really broken up by his request: a QSL card for *this* contact, by phone!

I ask you, how would you fill in a QSL card for someone sitting on a thunderbox 7,000 miles away and calling by telephone? Readability 5 Strength 9 with occasional QRM?

This chap has since rung me to confirm the contact!

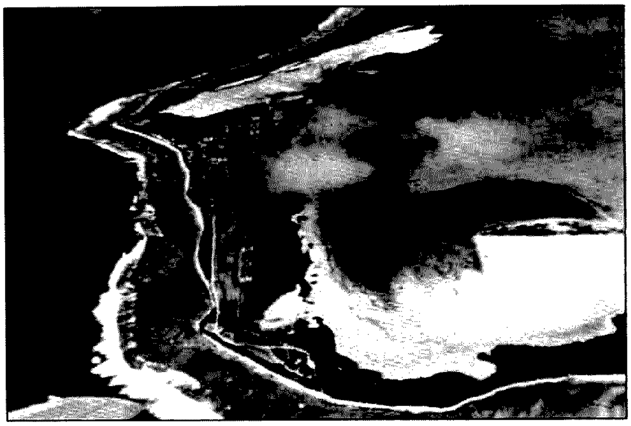
RISING TO THE OCCASION

A radio operations centre, set up at only a week's notice and manned by amateurs, provided an impressive communications network for this year's Melbourne to Hobart Yacht Race. A last-minute change in the administration of the Race saw the Tasmanian Yachting Association take over the D.S.S. role, to work with the Queen Racing Club of Victoria and the Royal Melbourne Yacht Squadron. The main effect was the need to set up a roster of trained operators to man the Tasmanian end of the sophisticated network linking Victoria, radio relay ships, and every boat in the fleet, from the moment the first one left Portsea, Victoria, to when the last one tied up in Hobart.

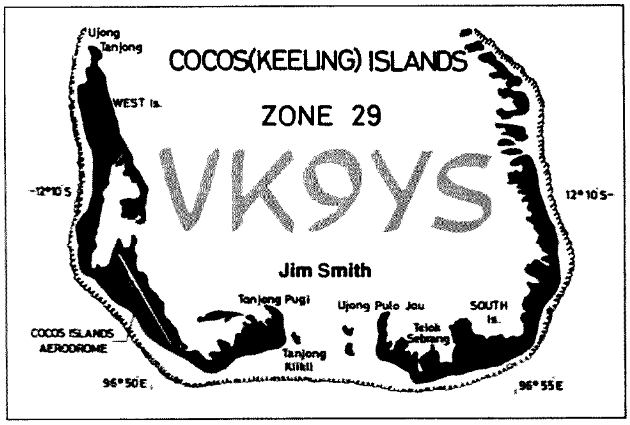
Greg Johnson, an amateur operator for the past 25 years, who has been closely involved with communications for this Race since its 1973 inception, was asked to coordinate. Nine registered members of the W.I.A. were co-opted into a team of radio operators working around the clock on a roster system.

Although all were trained operators and many had experience in emergency radio communications under difficult circumstances such as Civil Defense emergencies, "none had ever had any experience in running a yacht race," said Mr. Johnson. The end result was so successful, however, that it is possible that radio amateurs will again help man the radio centre for next year's race.

The experience and expertise of qualified radio operators has long been used in emergency radio operations, and it seems natural to extend these in helping in such major events as the Melbourne to Hobart, where good radio contact is of such vital importance. So, for amateurs themselves, the experience has been invaluable and has made them appreciate just how much behind-the-scenes organization goes into something like the West Coast Race.



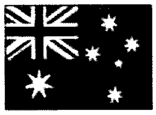
The landing strip on Cocos-Keeling; Home Island at last!



There were lighter moments, too. Like the phone call in the early hours of one morning. A question was asked: "Can you tell me something about seduction?" It took a moment for the operator to remember that there was a boat in the fleet called *Seduction*.

Operators involved in the project were VK3CCX, VK7KJ, -KJA, -KRB, -LJ, -FB, -ZAR, -NTL, -KV, -KDA, and -DJ with his two sons, Andrew and Peter.

My thanks to John VK7JK of QRM *and* The Hobart Mercury *for this information.*



COCOS (KEELING) ISLAND

J. B. (Jim) Smith VK9NS
PO Box 90
Norfolk Island
Australia 2899

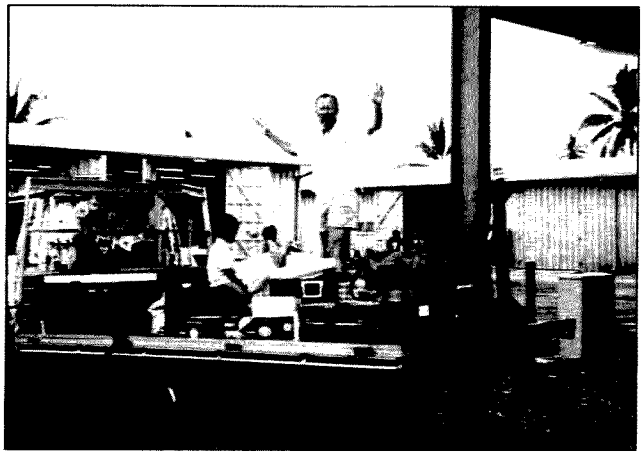
The following was edited especially for the International Section by 73's DXpert, Chod Harris VP2ML—Ed.

The dread amateur-radio nemesis Murphy was a constant companion on my 1987 DXpedition to Home Island in the Cocos Keeling chain. Despite almost continuous problems, however, I managed more than 10,000 QSOs as VK9YS from this rare location (38th on *The DX Bulletin*'s Most Wanted survey.)

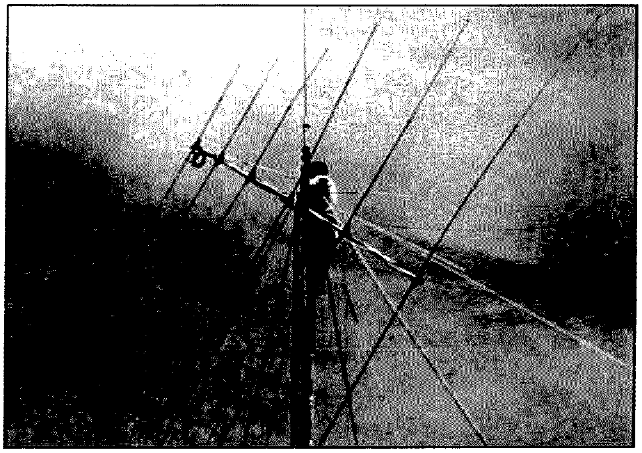
The trip originated out of several conversations with Bob Winn W5KNE, editor of *QRZ DX*, and with Cress Clunies-Ross VK9YC, who maintains a home in the islands. We discussed setting up an amateur radio station on Home Island for the use of visiting hams who wanted to be on the receiving end of a pileup, for a change.

Murphy's first contact with the DXpedition was in breaking up the three-man crew into two groups, as Bob's and Cress's schedules could not mesh. So Cress went first to Home Island to get the station set up, with myself and Bob to follow in a few weeks.

Murphy immediately struck again, as the fully-assembled 70-foot tower with 8-element log periodic beam crashed to the ground as it was being raised. Cress worked on the repair of the tower, but had to order replacement



Bob Winn W5KNE/VK9YW celebrates the loading of all the gear into our host's truck.



John Clunies-Ross puts the finishing touches on the 18–30 MHz log-periodic beam.

parts of the beam from Australia. Then my FL2100 amplifier failed to arrive; then Bob Winn did not arrive as scheduled. Things were looking very bleak for this trip.

Fortunately Murphy took a short break from his trouble-making, since I ran into Bob at the Department of Communications, arranging for his VK9YW license. (His hotel had lost his reservation.) The rest of our day went far better, as we obtained our licenses, visas for Cocos-Keeling, and air transport without undue difficulty, although Bob's credit cards weren't accepted for the charter flight to Home. We even negotiated a reduced rate for our excess baggage. Finally, John VK6JJ offered to loan his FL2100, to replace the still-missing amp.

Cocos-Keeling Finally

The next day we survived the humorless check-in procedure, and were soon high over the Pacific, on the 2700-km flight to the remote archipelago that lies 1000 km from the Indonesian coast. As we circled Home Island for landing, we marveled at the color range of the central lagoon, from white through every shade of blue to dark purple.

Our hosts John and Vicky Clunies-Ross met us at the airport and helped us load our considerable luggage into John's truck. We repeated this procedure at the lagoon jetty, for the 8-km boat ride to the VK9YC QTH. Soon we were settled in our rooms, and spreading our ham gear among the classrooms of a 100-year-old schoolhouse.

It soon became apparent that Murphy had flown over to Home Island with us. Grounding problems plagued our two separate stations until our hosts installed two 6-foot ground rods with a power shovel. Then the 18–30 MHz log periodic proved unusable. We lowered the beam and spent the next several hours disassembling it, cleaning the elements, and reassembling them. The balun was a total loss, so we substituted an rf choke made of coax. Soon the beam was back up and running, but its frequency range limited its use to 10 and 15 meters. Further, the beam was rotated by hand, and many frozen bearings limited rotation.

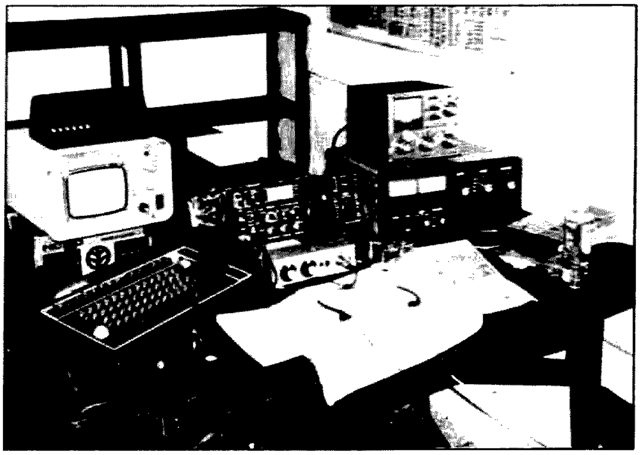
We made do with a dipole and ground plane on 20 meters while we waited for the promised repair parts of the larger log-periodic. Mutual interference was a constant problem, because the antennas all hung off the same mast.

The next weekend we went ahead and erected the larger tower, even though the beam parts had still not arrived. The additional support for low-band antennas and separation from each other's antennas reduced interference and boosted our QSO rates.

Band Conditions

Although I usually made the sunrise 80-meter opening, Murphy reared his head frequently, as generator problems often took us off the air during the crucial morning 40- and 20-meter openings.

Despite the problems, Bob and I managed plenty of contacts. 160 meters was especially rewarding during the short pre-sunrise openings. 80 meters was not as pleasant, as local QRM made CW contacts almost impossible, and



The VK9YS operating position, with ICOM 740, Yaesu FL2100, and RTTY gear.

heavy interference from European low-band DXers marred the SSB operation. 40-meter CW also proved effective, and I even managed almost 500 QSOs on 40 SSB, between the broadcast stations. 15 meters yielded many QSOs; I racked up nearly 3,000 on the band, even at the bottom of the sunspot cycle. Even 10 meters produced a few hundred QSOs.

Then on Tuesday the long-awaited beam parts arrived. We spent the better part of the next two days assembling and fitting the rear boom section into the existing front half of the antenna, at the top of the tower. We now had a 20-meter beam! But Murphy wasn't through with us yet. The brand new rotor control box spewed smoke when first switched on, and the rewound transformer also blew up with a bang. I salvaged a transformer from a defunct reel-to-reel tape recorder, and supplied power to the rotor control. But now the control wire to the rotor at the top of the tower showed open. Once more we had to climb the tower and rewire the rotor. I lost count of the number of times I climbed the two towers. Finally everything was set, but we had only two days to make use of this valuable addition to our antenna farm.

Despite all the myriad problems, Bob and I logged 18,500 QSOs from Cocos-Keeling, including 87 much-appreciated contacts on RTTY. About one third of my contacts were with Japanese DXers, and about one third were on CW. Bob spent so much time leaning on his operating table during his first-ever DXpedition that he damaged a nerve in his arm. Nevertheless, he caught the DXpedition fever, and is itching to go out again soon, damaged nerve and all.

Many thanks to Cress, John and Vicky Clunies-Ross, John

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PROPAGATION

Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U.S.S.R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

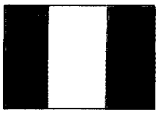
First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.
NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

The outlook for September is generally good, especially for HF bands, DX possibilities, and late operation on the higher bands (10, 15, 20). Conditions on a day-to-day basis are likely to vary according to the chart below. Trends are shown as conditions change.

SEPTEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G	2 G	3 G	4 G	5 G–F
6 F–P	7 P	8 P–F	9 F	10 F–G	11 G	12 G
13 G–F	14 F	15 F–G	16 G	17 G	18 G	19 G–F
20 F–P	21 P–F	22 F	23 F–P	24 F	25 F	26 F–P
27 P	28 F	29 G	30 G			

VK6JJ, Heather VK2HD, Ken VK5QW, Kan JA1BK, and Gin JA1ACB, and all the members of the Heard Island DX Association.



FRANCE

Chuck Martin F/AB4Y
CPU A-316
American Embassy Paris
APO NY 09777.

Chuck writes that Paris closed down for the summer—he was off to the Riviera for a two-week vacation and would write us a report on amateur radio in the south of France.

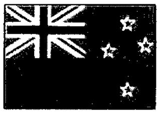
The Paris International Amateur Radio Association (PIARA) is dedicated to serving the international amateur community in Paris and throughout metropolitan France. Membership is free and open to all, and all members receive the monthly newsletter, the *Bugle*.

It was started by international amateurs here because licensing and operating in a foreign country involves special problems. The bureaucracy involved in obtaining a license can be baffling, as can be regulations, written in French. It also is difficult to get parts for U.S. equipment. PIARA has helped with these problems.

PIARA meets the last Saturday of each month at *Chez Jenny*, an Alsatian "brasserie" in the 3rd Arrondissement (district) of Paris. Their specialty is *choucroute royale*, a delicious platter of sauerkraut, smoked pork chops and sausages, all steamed in champagne. Sometimes we have breakfast meetings *Chez* F/AB4Y, where we have L'Aunt Jemima and Les Hash Browns, and an international dish: Creamed Chip Beef on Croissants.

Paris has one functioning 2m FM repeater. FZ1THF *(tres haute frequence)*—very high frequency—is on channel RØ: 145.000/145.600. Sadly, there is a great deal of malicious interference and jamming in Paris. The repeater has had to be shut down for long periods. There is simplex FM on 145.500 and 145.550. There is a superb 70-cm repeater on 431.725/ 430.125, callsign FZ1UHF. All FM repeaters in France require a 1750-Hz access tone.

Packet stations are active throughout France. There are two operating digipeaters in Paris: F6ABJ-2 and FF6KAL. There are three active PBBS systems: F6ABJ, F5LO, and FC1HPI. It is possible to connect with stations from the Channel coast to Orleans. Packet is expanding through France, and it soon will be possible to connect throughout the nation. There is no 220-MHz allocation in Europe, so interlinks are planned for the 430-440-MHz band.



NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

Hi from down under, again—no, we haven't dropped off the end, just having a short enforced spell under doctor's orders. Just as well I was fit and healthy this time last year when I was visiting in the U.S. and Canada. In fact, just about the time of writing this column 12 months back, I was visiting *73* and being shouted a long, cool 807 (or TU1—depending upon where you are from).

EARTHQUAKE

At 1430 hours NZT on Monday, March 2, a large earthquake centered in the Eastern Bay of Plenty, North Island, caused millions of dollars damage to the towns of Whakanatne, Edgecumb, Te Teko, Kawerau, and the surrounding rural areas of the Rangitiki Plains Basin. Widespread damage to property, telephone service, power supplies, water and sewage services, but miraculously there was no loss of life.

Amateur radio was again to the fore, providing additional communications for the overloaded Civil Defense system, which was also operated mostly by amateurs. The state of emergency was lifted on Thursday the 7th and replaced by a local emergency declaration for the Whakatane District. The length of the state of emergency was 76 hours, and the Regional CD HQ handled 697 messages on their network alone, beside the many hundreds more handled by the amateurs on their localized emergency nets, both simplex and through local repeaters.

Large factories, processing dairy products and those in paper manufacturing were the most affected by structural damage, but ground and property damage was extensive, with large cracks and gorges snaking their way through the landscape.

NZART CALLBOOK

Well, the NZART *Callbook* is out, with the many sections of useful information on such things as NZART Information, the ITU Amateur Radio Disciplines, Operating Information, an International section including the DXCC lists, DX zones, etc., other radio services within ZL, and a Data section. All this as well as the amateur callsigns for ZL1-4, ZL dependencies, and South Pacific island callsigns. Quite a bargain at $NZ13.00 (around $US7.00) plus postage and packing, from NZART Headquarters, PO Box 40-525, Upper Hutt, New Zealand.

After making sure my own entry was correct, the summary of ITU Annual Reports for 1986 caught my eye. I'm a sucker for figures (all kinds). Look at the comparisons between those in the Society who are licensed hams (first column of percentages) and the licensed hams who are members of the Society—second column:

Region I	**45%**	**48% of 352,793**
Region II	**87%**	**27% of 558,699**
Region III	**91%**	**24% of 751,130**

Wouldn't we be a strong voice if every country had a 100% membership in their society, like Indonesia has with its 40,000 licensed operators, all belonging. There are other countries in the 100% group, too, but in most cases only from 30% to 50% of licensed amateurs belong to their country's Society—which is the voice of Amateur Radio at the national and international bargaining tables. No wonder we have to fight so hard to maintain our frequencies, etc.—how much stronger would our voice be if all 1,662,622 licensed amateurs were Society members instead of the 501,595 who do belong.

RIVER CITY CONFERENCE

Our annual conference has been and gone—this year it was the "River City Conference," at Wanganui, in the North Island. Among the usual remits on frequencies, CW, power, etc., there was a report from a tribunal set up at the 1986 conference to examine "Structure and Control of Our Society," and make recommendations to NZART members and Council on any changes considered necessary to make our society functionally better.

The report was accepted, and a working group formed to oversee changes to take place at the 1988 conference. Basically, the main changes are as follows (*from* in light type, *to* in boldface):

- Control by a president, vice president, and 17 councillors elected for two-year terms. **Control by a board consisting of a president, four directors, a secretary, and a treasurer, elected or appointed for a two-year term.**
- Councillors elected on a District basis, the numbers proportional to the numbers of members in the Districts. **Zones to be created, each Zone to elect a zone chairman (by the Branch/Club delegates within the zones) who will be the link between HQ, the board, and Branches/Clubs, and members.**

The only area of contention is the number and size of branches in the proposed zones.

HANG-MOBILE

Not to be outdone by the mobile operation from the Space Shuttle, ZL amateur Guy Kendall ZL2BIV operated a mobile station from a hang glider on Sunday, March 8. Flying at altitudes of up to 6,500 feet near Lake Tekapo in the South Island, Guy had a QSO with Roger Corbett ZL3THQ through the 680 repeater nearby, and another QSO on simplex with the same station, 100 miles away. A Kenwood TR-2500 2m hand-held taped to the control bar was used. [*A nifty photo from* Break-In *could not be used for technical reasons—photos already screened and published won't reproduce well in another printing—Ed.*]

We are troubled here in ZL by hang-glider pilots using 2m handhelds for air-to-air communications, who are not licensed amateurs. They use our repeaters and frequencies, but are hard to locate since they can access the repeaters at great distances. The problem has increased since proper import licenses are no longer required and ham gear is therefore easier to obtain by nonlicensed persons. Are other countries having this problem?■

OCTOBER 1987
Issue #325

73 Amateur Radio

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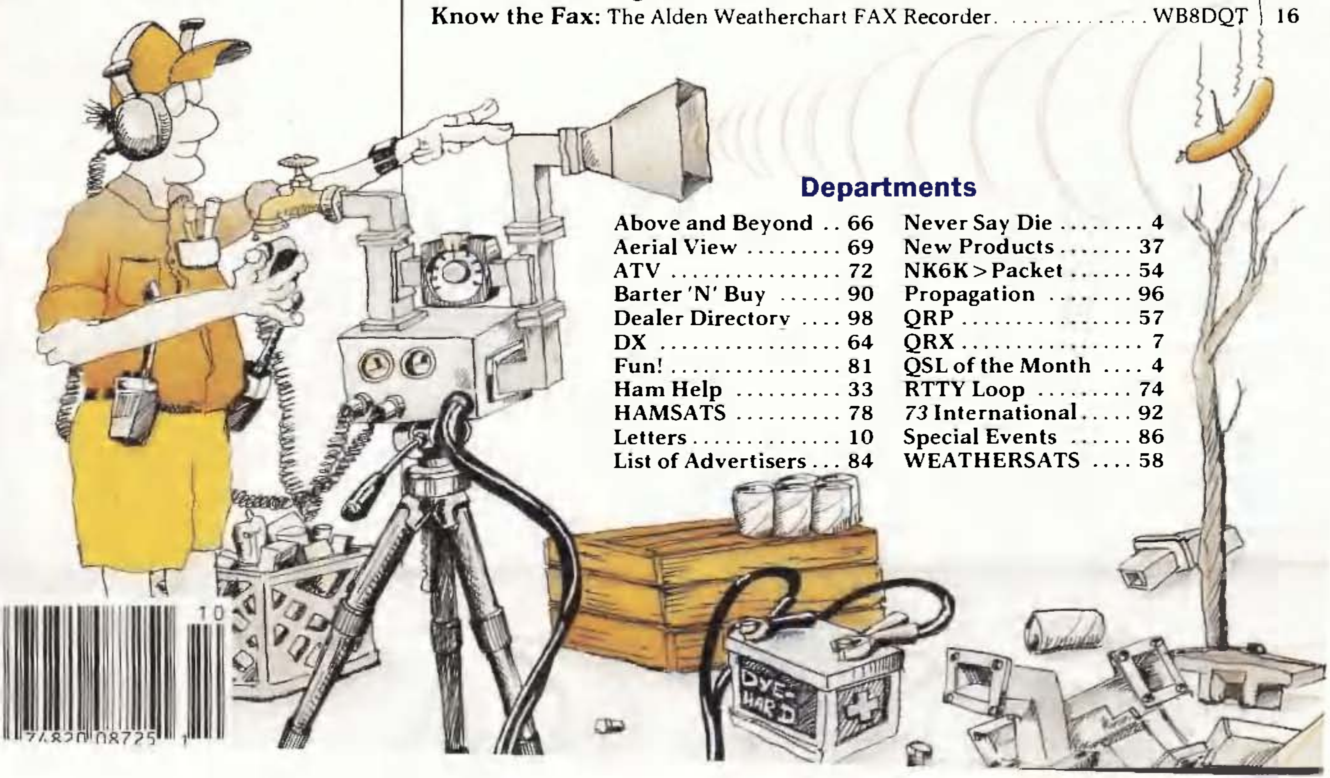
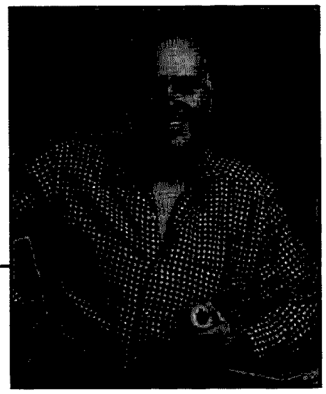


NEVER SAY DIE



ARE WE HAVING FUN YET?

Okay, what's the most fun you remember having in amateur radio? This is a hobby, in case you've lost perspective—it's supposed to be fun. Indeed, if the darned hobby isn't fun you'll probably fade away even before smoking, fat or too many 807s get the ARRL to issue you their final and most coveted award, your "silent key" certificate.

The word I have from a reliable source within the League is that the next "world" is made up of anti-matter, with the result that radio uses negative frequencies. Our positive frequencies can be heard weakly reflecting through when conditions are just right, but the signals from "the other side" are so weak they just add some background QRM to our pileups and few ever get through. That may not seem fair, but if you stop and consider all of the rotten things you've done, perhaps you'll agree this is well warranted.

Hey, don't look at me with that innocent look, I've been around this crummy hobby long enough so I've heard you out there. I've heard you kerchunking repeaters. I've heard you jamming the service nets. Even worse, I've heard you in DX pileups intentionally and illegally interfering with your fellow amateurs. I've heard your bad language—your fatuous remarks—your calling CQ without checking the frequency—tuning up your rig on the air instead of into a dummy load. No, you're guilty and probably need a few years of come-uppance so you'll be a better person when your spirit is recycled.

Yes, I've seen you at your ham club making life miserable for any Novice who dares to come to a meeting—I've seen you at the flea markets looking for some poor sucker selling a rig who doesn't know what it's really worth—and I've seen you pawning off hopeless gear as "like new" at the same flea markets. Shameless.

You think I don't know what you were doing when you were a kid in your hamshack while your peers were out dating? I wouldn't wonder that Hiram Percy Maxim will personally be waiting to sign your Silent Key certificate and issue you a spark transmitter with welded key contacts.

No amount of church-going or religious contributions are going to absolve you from your sordid ham past. Not even political contributions will get you out of this one. No, you sinner, the only way you can repent and have even a ghost of a chance at absolution is to get started immediately Elmering teenagers into the hobby—and proselytizing for a no-code ticket. I'm talking fanatic now, not lip service.

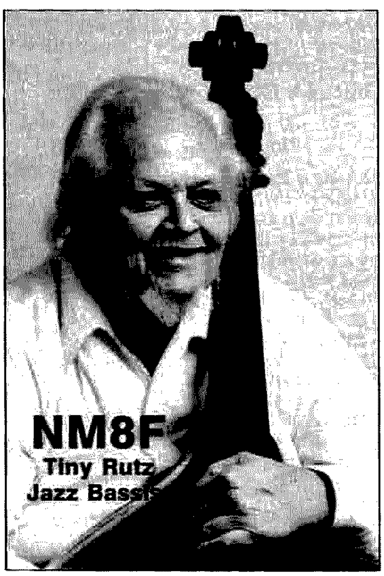
It's too late to drop out of the hobby and hope Hiram won't notice as you try to slink by him, hiding your Silent Key certificate. No, once you got your ham ticket you accepted the responsibility to productively use the billions of dollars of radio frequencies reserved for hams.

Oh yes, I was asking about fun. Hamming has got to be fun if we're going to help it survive. So what's ham fun for you? Is it using your ten kilowatts to grind those low power turkeys into the noise level? Or do you get your enjoyment helping others work a rare one by offering to run a list? Are you handling QSLs for some rare one, making hamming a tad more fun for him? Are you getting your kicks from Elmering youngsters? Perhaps you're running a repeater which is making hamming more fun for dozens?

I've been hanging around 20m lately, but DX has been slow, so almost every contact I've had has been with a retired person without much to talk about. That gets old fast.

The early days of repeaters were fun. I used to drive to the top of Pack Monadnock, about three miles from home, and see who I could work from there. On good nights I was able to work New York City—and occasionally

Continued on page 42



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

QRM

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QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

Celestial PBBS

THE LONG-AWAITED BULLETIN BOARD SYSTEM OF FUJI OSCAR-12 has been successfully loaded and is apparently functioning well. It is estimated that in its first few days of operation, over a hundred messages have been posted and received. This comes after more than ten months of hard work in overcoming earlier software problems and constraints on use imposed by a tighter-than-expected power budget. The software was finally loaded by JAMSAT technicians at 0440 UTC on June 21.

The experimental mailbox software Version 1.0 has some limitations, and is slightly different from the descriptions given in *QST* and *ASR*. Version 1.0 of the mailbox program has the following commands:

- F : List latest 10 message headers with message number
- F* : List all the message headers
- Rn > : Read a message numbered n >
- W : Send a message. You will be asked receiver and subject. Send CR > CR > or CR > Z CR > to end the message.
- K n > : Kill a message numbered n >. A message being read by other station(s) cannot be killed. FO-12 BBS is a multi-user system. Only originator of the message can kill messages.
- H : Help

Your TNC should be set for the following parameters:

Protocol : Version 2 WA8DED PROMs needed for TNC-1.
Command TNC-1 : V2
TNC-2 : Ax2512 v2 ON

T1 Timer : 6 seconds or longer
Command TNC-1 : F6
TNC-2 : FRack 6

Max Frames : 2 or 3 is suggested
Command TNC-1 : 02 or 03
TNC-2 : MAX 2 or MAX 3

The callsign of FO-12 which you use to connect is 8J1JAS. There is no logout command; simply disconnect using the TNC's disconnect command. No personal mail is supported by the first version.

Good luck on using the first satellite PBBS!

RS-10 and RS-11 Launch

THE LAUNCH IN LATE JUNE OF THE SOVIET UNION'S LATEST AMATEUR RADIO SATELLITES went off without a hitch, and so far have been doing well. The RS-10 and the RS-11 appear to be identical except for their frequency use. Both use five modes (K, T, A, KT, KA). Uplinks are 15m and 2m; and downlinks are on 10m and 2m.

JY1 Diplomacy

HIS MAJESTY KING HUSSEIN JY1 OF JORDAN HAS BROKEN THE ICE with communications with Israel, although not officially. The Radio Society of Great Britain reported that the event occurred on April 18th when His Majesty paid an impromptu visit to a British amateur, Ed Benou G0BBD, in Middlesex, England.

During his visit, the King, using his UK callsign G0DEY/JY1, made numerous contacts on 20m SSB—most with Israeli hams! These contacts occurred in the week of the Jewish Passover celebration, and the King took the opportunity to extend his Passover greetings to the Israeli hams. Kol Israel, the country's international shortwave service reported: "Once again, the amateur radio shortwave bands have been used in a most striking fashion to display international goodwill."

This event is significant because there are no amateur radio exchanges permitted between Israel and the surrounding Arab countries, except Egypt. Perhaps this notable gesture of goodwill will help in freeing these restrictions.

Stock in AR

WILLIAM HIGGINS WA2RXQ, A MEMBER OF THE NEW YORK STOCK EXCHANGE, designed a mobile phone unit which allows him to do what normally isn't done—talk with customers directly from the NYSE's floor, and trade stocks for them. Up until now, phone links to the floor (of which there are 7,000) have been linked only to the trading rooms of member firms. This is in accordance with the policy of the Big Board forbidding nonmembers of the Exchange, such as brokers' clients, from having direct access to the floor.

Higgins explains that his mobile communications allows him to give his clients better service, and gives independent brokers a weapon to compete with the powerful trading houses. Big Board officials see it differently, contending that Higgins is giving his costumers an unfair advantage over investors who can deal only with off-floor brokers, and so have fought against his right to have a phone on the floor since 1980. Sixty-thousand

Bob Lucas WA0DXZ/5 in the 73 Magazine *Dodge GLH Turbo autocross car in Albuquerque NM. The co-driver Marlene Ellis KA5WXM took the photo. They had just run the SCCA Rocky Mountain Solo II championships on June 13–14, and placed fifth in the event.*

dollars in legal fees later, Higgins had his right to a phone on the floor confirmed, setting a precedent which has inspired other independent brokers to go after their own institutions.

First DA Ham Contact?

ON JULY 15, JERRY TURPIN N4IMU (now AB4CT) and Art Ogden N4HAN, made 2-way digital audio contact on 145.09 MHz using packet to transmit the digital signals. Their speech was sampled 4000 times/second, giving it a fidelity of about 2000 Hz, making it communications-grade audio. One drawback they encountered was that, given such a high sampling rate and low sending rate (1200 baud), one second of speech has a delay of about ten seconds. Jerry is working on a program to reduce the sampling rate by looking for repeating units in speech—such as pauses—in order to make contacts more real-time.

Radio Shack in Amateur Radio

THE FLOOD OF NEW NOVICES resulting from Novice Enhancement has spurred the Tandy Corporation, which operates 8,500 Radio Shack stores worldwide, into joining the Amateur Radio market. Once it became apparent to the Vice President of Consumer Products Merchandising, Robert Miller, (a new ham), that the Commission would be approving Novice Enhancement, he arranged for Gordon West WB6NOA and Fred Maia W5YI to prepare a Novice Package for the Radio Shack chain. This package became available in August.

We look forward to Radio Shack's increasing involvement in the Ham market.

East-West Launch

AS EARLY AS FIVE YEARS FROM NOW, the Soviet Union may begin to launch western-built OSCARs, according to representatives of several AMSAT national organizations, including Dr. Andras Gschwindt HA5WH. HA5HW, the IARU Region 1 satellite coordinator, was interviewed for the international shortwave broadcast "Media Network", which airs on Radio Netherlands. In the interview with program producer/host Jonathan Marks G8WGN, Gschwindt said that "the first step have been taken to arrange a launch of a Soviet rocket with a western-made satellite aboard, sometime around 1990."

Arrgh!

Just *what* is that annoying staccato transmission which ranges along the HF bands at times, drowning out all contacts? Here's some info on the too-familiar Russian Woodpecker. . .

There are three large over-the-horizon back-scatter (OTH-B) radar systems in the Soviet Union. One is located near Nikolayevsk-na-Amurye in extreme eastern Siberia, another near Nikolayevsk in the Caucasus mountains, and a third near Gomel, about 175 miles southeast of Minsk. The first and last are directed at U.S. ICBM fields, and can provide up to an half-hour warning of a strike launched from the U.S. They can also detect U.S. planes. The third OTH-B radar system is directed southeast to provide warning of a Chinese ICBM strike. The transmissions are extremely powerful—40 megawatts and more—and range across the HF band from 4 to about 27 MHz, depending on the ionospheric conditions. At dawn, they generally appear at 14 MHz and below, often around 14.215 MHz. The signals move up and down this band segment in 10 kHz steps at intervals of 30 seconds to ten minutes. The bandwidth varies from 30 kHz to more than 300 kHz. The Woodpecker has a basic pulse repetition frequency (PRF) of ten per second.

VEC Meeting

THE QUESTION POOLS used to test candidates for new or upgraded amateur licenses will be revised only every three years, and VECs will petition the FCC to return to the old rules governing code tests. These were the two main decisions of the VEC meeting held July 11 at the ARRL National Convention in Atlanta. The previous rules for the code tests stated that telegraphy tests "may" and not necessarily "shall" contain all required letters, numbers, and certain punctuation and operating procedure signs.

Pirate Net

IN LATE JUNE, the FCC, on a lead from *Westlink*, shut down a pirate radio network in the Los Angeles area. It turns out that the group had been operating an FM repeater near the 11m CB band, and there is evidence that there were *200–300* members in the group. *Monitoring Times* reports that "crossband inputs to the repeater included out-of-band CB frequencies, cordless telephone channels, and even the unallocated frequencies between UHF general mobile radio service channels"

Most of the inputs used tone squelch, and the FCC confirmed to the press that the primary repeater location for the network was atop the Palos Verdes peninsula, just south of Los Angeles. It's not known whether hams were involved in this network; the FCC did not identify any of the busted members as hams in their release to the press. The FCC in San Diego also says that it is coming down hard on a number of businesses which have been selling illegally modified radios and CB linears in California and Arizona.

PRB-3

IF THE FCC decides to farm out the issuing of secondary and special amateur radio callsigns, the ARRL won't be alone in asking to take on the project. Forrest Industries Telecommunications of Eugene, Oregon filed comments with the FCC asking to be named as a special callsign coordinator if the terms of PRB-3 are approved.

Also wanting to be SCSCs are: *Callbook Magazine*, Buckmaster Publishing, The Central Alabama VEC Inc., the Sunnyvale VEC-Callsign Inc., Fred Maia W5YI, and others, including at least two or three reported requests from non-U.S. companies and individuals.

Polar Trek

COMMUNICATIONS WITH AMATEUR RADIO SATELLITES as well as the internationally operated Sarsat/Cospas satellites will be a vital part of a joint Russian/Canadian polar skiing expedition next February according to PA0DLO and G3IOR. Leonid Labutin UA3CR, a well-known polar explorer and Radio Sputnik proponent, will be part of the group of Russian and Canadian scientists venturing across the pole late next winter.

Voice and data communications may be employed on the satellites. A new hand-held satellite communications transceiver was recently demonstrated in a March issue of Soviyetskaya Rossiya. It is believed to be a low-speed data (perhaps packet) communications system that could probably be used with RS-9 after it is launched. According to G3YJO, there have been preliminary discussions about carrying a UO-11 DCE station with the expedition.

PRB-3 Update

THE FCC JUST RECENTLY CLOSED PRB-3, the vehicle for receiving proposals from the private sector on privatizing the issuance of specific callsigns in the Amateur Radio Service. The FCC is now considering these proposals, and it is expected that the Amateur Radio community will be able to select a specific callsign early next year. The FCC suggested a cost of $10–$100 for each selected call. Thanks to Fred Maia W5YI for this update.

Articles

Keep those articles coming in! Get your great ideas in print and get paid for it to boot. *73 Magazine* pays the most in the market for publishable materials.

Credits

Thanks to *Business Week, Westlink, W5YI Report, LCARA*, N4IMU, and WA0DXZ/5 for this month's news pieces. Send your news items to *73 Magazine*, WGE Center, 70 Rt 202 N., Peterborough NH 03458-1194; Attn: QRX

LETTERS

HANGING IN THERE

As a prospective amateur radio operator, I just wanted to let you know how much I enjoy your magazine. It surpasses by far any other publications in its class, such as *Radio Electronics* and *CQ*. I find (Wayne's) editorials quite amusing and a major factor to the success of your magazine.

One thing that troubles me is the type of people that this hobby attracts. Being a prospective operator, I figured a good place to find out about my hobby was the ARRL in Newington; boy was I wrong! All three times I went there, I was greeted by a receptionist filing her nails. I decided to purchase one of their publications—the look she gave me could have sent a chill down the spine of a desert rodent.

I have attended several Hamfests in the New England area. Never before did I see so many con men in one place. I made the mistake of mentioning I did not have my license, and you would not believe some of the junk I was being peddled. If a piece of equipment is brand new, then why are there scratch marks where the covers have been removed more times then I care to know about?

Just walking around, I listened to some of the hams talking. Most of it was about who had the biggest antenna or the most powerful rig. I approached a couple of hams hoping to find some support or guidance but was greeted coldly, like I was invading some big secret.

I am not implying all hams are bad. I found someone to help me who happens to live only two miles away. Help is always closer than you think! So, I am relying on the good hams, your magazine, and the many books I have purchased, to learn the interesting hobby of amateur radio.

Call me discouraged, but not a quitter!

Kevin Romanic
Tolland CT

Kevin, I hope you caught the gal at HQ on bad days - sounds like the workers in Russia! I've always been enthusiastically greeted at the League. I don't think you'll find New England has a corner on sharp trading at flea markets—no place for the unwary—they're called "thieves markets" in some areas. . . perhaps a more fitting name. Look for me on 20m.—Wayne

NOT WITHOUT REASON?

Well, on the off chance no one else congratulated you on your editorial in the April issue, I will. Every once and a while, someone really succeeds in putting really heavy thoughts on paper, and you did it that time. The critique of how establishment "hamdom" is failing to live up to the purpose of its franchise should rank with the Magna Carta and the Declaration of Independence. You hit the nail on the head so spectacularly that you might just have succeeded in ranking Wayne Green in the same league as Thomas Jefferson.

You analysed the problem in such a logical fashion that you had to have attracted the attention of the great silent majority. I predict the criticism from your corps of loyal detractors will probably be disappointingly mild, maybe even a total letdown.

I hope you continue to follow up on this editorial in your public appearances. By spreading the message and reinforcing the ideas of replacing good little "establishment hams" with people who have the brains and drive to begin the long overdue revitalization of Amateur Radio, we might succeed in reversing the downhill slide.

"Never Say Die" has been replaced with *"Non Sans Droit."*

Robert E. Brossman W8PMS
Wheeling WV

Thanks for taking the time to drop me a note—it's appreciated. Alas, I've found that many league members label any efforts to change the ARRL as attacks. I've never had any indication that they actually read or consider such ideas. Makes it difficult to bring about changes, no matter how desperately needed.—Wayne

LIKE YOUR STYLE

I have submitted a subscription order for *73 Amateur Radio* under separate cover and wanted to let you know why.

Quite honestly, I like your style. I haven't been a ham for very long, only since November of last year, but have formed some very definite opinions as to what is right and wrong with our hobby. After hearing you speak in Richfield, Minnesota, last year, reading a few issues of your magazine, and listening to other hams, I found that I agreed with you far more often than not. (I, for one, like *CW*).

There are almost no young people involved in what should be a hobby crawling with kids interested in computers and electronics. I was active on 2m repeaters in the Minneapolis/St. Paul area for six months earlier this year, and in that time I talked to a grand total of two hams still in high school. If I had to guess, I would say that one third to one half of my contacts were retirees. I'm 31 and from looking around at the testing sessions I have attended, think I'm fairly typical of today's new ham—when I should not be. We need to get kids excited and involved in radio and I like your ideas there.

With the exception of packet, there just isn't a lot of excitement in the ham community for radio technology. I want to see articles about hardware pioneers. I'm not much of a builder yet, but enjoy finding out how things work and how to put them together. I also enjoy reading about the satellite program, and am going to try it as soon as I can kludge together a station.

Most of all, I discovered long ago the value of playing devil's advocate as a way to get folks moving—by getting them mad, and you do it well! Keep up the good work.

Mark Hunn
Groton CT

Make people mad? Me? Baloney!—Wayne

A LITTLE MEANS MUCH

This letter is in response to the column "Never Say Die" appearing in the June issue of *73*.

I agree that English should be recognized as the foremost language of this country, and that a good command of English is a prerequisite to success. But you have down-played the value of English-speaking Americans learning a foreign language on the grounds that it's hard work and not immediately useful. If we only did what was easy, where would we be as a nation? As far as being useful, let me illustrate my point.

I am a software troubleshooter working for a California software firm. From time to time I speak with clients in French-speaking Canada, or in Latin America. I am fluent in neither French nor Spanish, but I do know a little of both. When I speak with a client whose English is not good, letting him know that I speak a little of his language, usually lets him loosen up and be more comfortable with English. That's aiding *international* communications!

As hams, we are all working in an international medium by choice. Let's recognize the international nature of radio and not be arrogant by demanding that those outside our borders speak English. Instead, we should encourage them to speak English by meeting them half way— by learning a bit of their native language.

Jeff Cauhape
Boulder Creek CA

MAS DESPACIO, POR FAVOR!

Shame on you for your comments on the use of English on amateur radio. I know a number of amateurs who have learned Spanish by practicing it on the air and had a lot of fun at the same time. Latin Americans appreciate it when someone takes the trouble to learn Spanish and they do not insist that the Spanish they are listening to be error-free. Most of the Spanish-speaking stations that one hears on the air, by the way, can speak English—at least enough to make a short QSO. Obviously, the same cannot be said for us Ws.

Rather than encourage your fellow amateurs to be smug in their isolation from the rest of the world, I should think you would encourage amateurs in the U.S. to open a new chapter in the use of our hobby by using it to learn another language. Japanese would be fine, too. How do you think Chip K7JA parlayed his knowledge of Japanese into a good job with Yaesu?

Partly due to communications, which we have helped to develop, the world is becoming a smaller place. No matter where people live in this world, they will be hearing more and more foreign languages spoken. Sen. Hayakawa's initiative, unfortunately, is an attempt to harken back to simpler times, times which will never return. The age of communications

has made knowledge of foreign languages not only useful but probably necessary, in the future, if the United States is to hold its postion in the world.

Fred Laun K3ZO
American Embassy (USIS)
Nicaragua

Smug, Fred? Baloney! The more foreign amateurs learn English, the more business opportunities they will have. Of course it's good business for an American working in a foreign country or for a foreign employer here to know the language—but for the other 99.9% of us the time spent on a foreign language is wasted. This has nothing to do with chauvinism or American ego, it's just common sense. . . which I realize is an oxymoron—Wayne.

PACKET FROM BUENOS AIRES

Just *read your* July editorial, and couldn't agree with you more. Some of the new and exciting technologies seem to be completely overlooked by the amateur community.

Perhaps it's due to our over-dependance on Japanese equipment. Having visited Japan several years ago I came to realize that most, if not all the equipment which shows up on the American market, is nothing but warmed-over Japanese market gear adapted to U.S. standards and requirements. Nothing specific for the States seems to be coming out of Japan these days and yet in some areas, such as packet and computer interfacing, we're light years ahead.

You really touched a nerve when you asked about digital voice. The packet network has the potential to make amateur radio into a completely new hobby, and digital voice is the key.

The world is changing, and I'm afraid some of our co-hobbyists are still lamenting the demise of spark transmitters.

Keep up the good work.

Ken Price K2TIS/XE1TIS
Buenos Aires

PS: This is coming to you via packet-switching from Buenos Aires. When will the hams catch up with commercial operations?

HELPER BECOMES HELPEE

Recently one of the local hams found his ham ticket to be a real lifesaver. Mel Mc Dermott WB0AQS became a ham shortly after he retired. He has enjoyed QSOs with local hams, is active on HF, and is the real inspirational drive for our 10-meter Nut-Net which meets at 7:30 local time on 28.430 MHz daily.

Hams frequently are called upon to help with communications during times of emergency. Mel found himself in service during the Mexico City earthquake disaster.

Mel, who is seventy-eight years young, has had a bit of heart trouble lately, so when he began feeling ill while visiting Bud Nessler KB0QL, he thought it best to go home and lie down. On his way home, he decided that this time it was he who needed help. He called Bob Wagner W0YLQ on 2-meters to have an ambulance come to get him. Bob used the local autopatch to reach the 911 emergency number. Meanwhile Mel blacked out, and his foot slipped off the brake pedal. His car rolled backwards down the street, jumped the curb, crossed the sidewalk, rolled through some shrubbery, and came to rest against a house.

Another ham who lived in the vicinity was monitoring the frequency and decided to go to Mel's aid. He hopped on his bicycle and arrived at the reported corner about the same time as the ambulance. Mel could not be found since his car was fairly well hidden by the shrubbery. Mel eventually awakened and could see the ambulance and Bob from his spot. Once again he used his 2-meter rig. This time it was to contact Bob and let them know where he was.

Mel had to have a pacemaker installed in his chest. Although at first he was a little concerned that his hamming might come to an end if his radio were to interfere with his pacemaker, after a check-up with and without the radio he was told he could operate his radio—although he cannot operate his car.

It is very comforting to know that there are countless hams who are willing to help people in distress. It is a terrific hobby, and it is people like them who make me proud to be a ham.

Mike Jozefowicz NS0U
Dubuque IA

CODE IS FUN

Several years ago, I wrote a letter saying that the only reason I couldn't get my Novice license was that the code was designed as an insurmountable barrier to keep me out. I complained that I couldn't get any help learning the code from the Hams in this area.

Well, I want you to know that I not only passed my Novice test, but two days later I also passed my Tech. Now I don't want you to think I did this by myself. I had a lot of help and would like you to publish this letter to encourage other *hams to* help Novices.

I have changed my opinion about the code in that I now think code is fun. But I still don't think that code should be a part of the requirements for a license. After all you don't have to memorize Baudot or ASCII to qualify for a license. I was already a CET and I hardly had trouble with the written test.

Rick C. Wilson
Chattanooga TN

MOVING ALONG

A few comments on the current state of affairs on the ham bands—perhaps we should call them gripes. I feel that awareness might suppress some of the problems I find through my own operating.

As I work mostly 40 CW from the mobile, QRM is not much of a problem. The band is too little used for that. It does appear that QRN is a very serious problem for more than a few of us. In recent months, I have been unable to finish several contacts due to the claim of the other operator that goes like this: SRI OM-MISSED ALL-BAD QRN-73. This seems to happen shortly after I have answered the other fellow's CQ.

I realize a mobile signal will be a bit weaker than with a big skyhook in the back yard. I usually get decent reports, in keeping with band conditions and such, so I pretty much know that if I hear a guy 579, he should have no problem with me. So when a guy gives me a 579, then tells me he has QRN too bad to hear me, I wonder why this guy even called CQ.

Another problem is CW ops who cannot copy. Did you ever hear a call like KE2PXM2? How about KE2PCM2? Hey fellas, either you are not paying attention (thus not really interested in who or what you are working and should be in front of the tube), or your code readers are broken, or I cannot

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Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0745-080X) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

ICOM America, Inc.
2380-116th Ave. NE
Bellevue WA 98004
Price Class $2499

ICOM IC-761

by Bill Clarke WA4BLC

"Give me the luxuries of life and I will willingly do without the necessities."

Frank Lloyd Wright

ICOM's IC-761 is the latest HF entry from the Land of the Rising Sun. It is a fully solid state, digital displayed, highly sophisticated radio communications device. I know those are not words normally used to describe a piece of ham radio equipment, but the 761 is no plain piece of ham radio gear. It is the most precision-crafted and complete ham transceiver from ICOM to date.

First impressions

The IC-761 is larger than the Kenwood TS-940, and is black. It is solid in appearance and feel, with a formidable 69-control front panel. It rounds itself out with memory functions, a built-in antenna tuner, full break-in keying, electronic keyer, and high-stability crystal unit. Naturally, the 761 can be used as a very effective short wave receiver. It can also be remotely controlled by computer via an RS-232C/serial-port connection.

The instruction manual that comes with the 761 is the best laid out manual I have seen in several years. Replete with pictures, diagrams, and easy-to-understand explanations of each individual control, it is as much state of the art as is the transceiver itself.

Operating impressions

With a rig as sophisticated and complicated as this one, I needed to completely review the manual before any on-the-air operation was done.

The smooth weighty feel of the tuning dial is impressive (and adjustable) giving the feeling of total control. This is a welcome improvement over other manufacturer's radios. The digital readout is very nice, with no background flicker during tuning, and easy-to-read large blue numbers. Additionally, the memory numbers (and some of the other information that appears on the display) are in red. No confusion here.

I do wish, however, that there was 10 Hz readout. This is available by switch selection (or internal modification) on many other contemporary HF transceivers.

The tuning rate is adjustable from 5 to 500 kHz per turn. Under ordinary circumstances the user will be tuning at the rate of 5 kHz per turn of the dial. If the dial is turned at a fast rate, the tuning rate picks up to 25 kHz per turn. If the TS button is pushed, you clip along at 500 kHz per turn. I thought this was a change from some of the earlier ICOM transceivers, so I did some checking. The 751A tunes at 2 kHz per turn in slow speed, and the venerable 730 tunes at 1 kHz per turn. I like the slower tuning rates better; however, the large tuning dial of the 761 makes for easy tuning.

Photo 1. Front panel of the IC-761.

The digital keypad, used for direct frequency entry, has excellent tactile and audio feedback. You push a button, and know you did, not think you did.

With the advent of all the solid state radios over the past few years, I think everyone knows all about passband tuning and i-f shift. The 761 has both, and they perform as expected. They share a common control that is detented for the zero point. In addition to these tunable receive features, there is a filter switch that allows switching to alternate filter schemes.

The memory feature is particularly nice in that when a memory frequency is selected, you can immediately tune away from it by turning the main tuning dial. To return, merely push the MEMO button.

The notch filter works very well, allowing easy night operation on 40 meters. It is a deep notch, however; very sensitive to tuning.

I tuned in the local country-western station on AM and listened to it. The audio quality was excellent. It makes a nice change after you've been in a few pileups with the Saturday afternoon kilowatt bunch.

The quality of the receive audio from the built-in speaker compares favorably with my main station speaker. It is not tinny sounding. There is a tone control for base and treble. There is not a large amount of variation, but enough to make a light voice sound more authoritative.

The receiver is very quiet, and doesn't get overly excited by summer static. Background noise is almost nonexistent. I found the noise blanker capable of removing offensive woodpeckers and the garbage caused by a faulty florescent light in my laundry room.

Scanning is possible, with several modes to select from. I found that scanning the 10-meter band was profitable when checking to see if the band was open and when looking for beacons. It was easy to scan the memories for activity on any of the several nets I operate on.

Transmitter

The 761 has two VFOs—really handy for working SSB splits. For CW splits, you can normally get by with the use of RIT (transmit). Split-band operation is possible with the 761.

The 761 is easily modifiable for use on oddball MARS frequencies, although many can be reached with the factory set up.

The keyer behaved wonderfully, and QSK is where it's at for the CW operators. I could find no fault when operating QSK, and could be broken with single dit. The note was approved of by all.

The monitor feature is a great adjunct when setting up your compression levels or testing various mikes for tonal qualities. Just put on the headphones and listen to your own voice.

It's also possible to vary transmitted voice tones with a pot inside the 761. The pot can be preset to highlight highs or lows, at your choice.

The audio reports I received were interesting. Most indicated I had excellent audio, a couple stated I was overdriving the rig. Several contacts asked what amplifier I was running. Just remember, audio reports vary with the receiving operator's hearing and preference. Reports from stations knowing my voice were all positive.

The built-in antenna tuner got a poor workout here, as my antenna system is pretty well peaked up. However, I was able to give it a test on 80 CW by using the 75 phone antenna. It took only 2 to 3 seconds for the automatic tuner to do its work, and I was on the air again.

The relay used to key linear amplifiers is a little anemic. I recommend the use of an external keying relay. ICOM is not alone with this problem. I recommend an external relay for most of the current transceivers.

Contrary to popular belief, a failure of the lithium memory backup battery will not place the entire transceiver off the air. It will only mean you cannot save and recall frequencies. Replacement does not appear to be a complicated matter.

Bench Testing

Bench testing is the only true method of measuring performance of any of the currently available amateur transceivers. I feel that all of them are capable of performing above and beyond the capabilities of the human ear, and certainly over the poor band conditions we often experience.

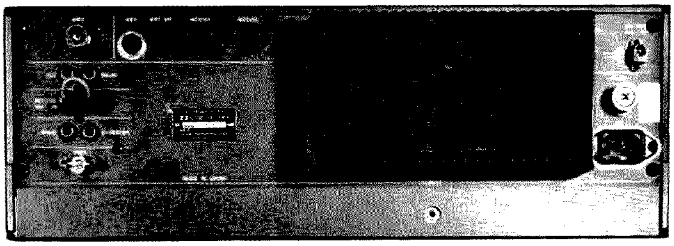

Photo 2. Rear panel of the IC-761.

The following equipment was used in checking the performance of the IC-761:
Leader LDC 8243 Frequency Counter
Marconi Instruments 2022 Signal Generator
Hewlett Packard 606 HF Signal Generator
Hewlett Packard 651A Audio Generator
Bird 43 Wattmeter
Hewlett Packard 8551B/851B Spectrum Analyzer
Cushman CE-5 Monitor
Tectronics 475 Oscilloscope

The specificatons and test results of the rig are shown in the sidebar.

I could find no fault with bench operation of the 761, and found no place where the advertised specifications were not met or exceeded. Again, the rig is capable of outperforming many ears and conditions.

Wrap Up

Not all the features of the IC-761 (or any other top of the line transceiver) will be of use to all operators, nor will the price be acceptable to everyone. However, feature for feature, the IC-761 is a most capable piece of equipment and is real competition for other top of the line transceivers. With the exception of the few faults I indicated in my observations, I feel comfortable in recommending the 761 as a good piece of equipment, albeit a little rough on the wallet.

Thanks to the folks at the Electronic Equipment Bank of Vienna, VA, for the loan of the IC-761, and the use of their very complete test bench.■

SPECIFICATIONS

Frequency Coverage

Receive: 0.1 MHz–30.0 MHz
Transmit: 1.8–2.0
3.45–4.1
6.95–7.5
9.95–10.5
13.95–14.5
17.95–18.5
20.95–21.5
24.45–25.1
27.95–30.0
Modes: SSB (A6J) / CW (A1) / FM (F3) / RTTY (F1) / AM (A3)
Frequency Control: CPU-based 10-Hz step digital PLL synthesizer
Frequency Stability: (±) 100 Hz (14–140°F)
Antenna Impedance: 50 Ohms
Power Requirements: 100–120 Vac
Dimensions: 424 mm x 150 mm x 390 mm w/o projections
(16.7 in x 5.9 in x 15.4 in)
Weight: 17.5 kg
38.6 lbs

Receiver

Conversion System: SSB, CW, RTTY, AM quadruple conversion
FM triple conversion

I-f Frequencies:		
	1st i-f all modes	70.4515 MHz
	2nd i-f SSB	9.0115
	CW/RTTY	4.0106
	FM/AM	9.0100
	3rd i-f all modes	455 kHz
	4th i-f SSB	9.0115
	CW/RTTY	9.0106
	AM	9.0100

Sensitivity (preamp on): SSB/CW/RTTY
for 10-dB S/N .1–.5 MHz less than .5 microvolt
.5–1.6 1.0
1.6–30.0 .15
AM (narrow filter)
.1-.5 MHz less than 3 microvolt
.5–1.6 6
1.6–30.0 1
FM
28–30 MHz less than .3 microvolt at
12 dB SINAD (Signal to Noise and Distortion)
Squelch Sensitivity: less than .3 micro volt

Selectivity:		
	SSB (filter on)	2.4 kHz/-6 dB
		3.8 -60
	CW/RTTY (filter on)	500 Hz/-6 dB
		1 kHz -60
	AM	6 kHz/-6 dB
		18 kHz -50
	FM	15 kHz/-6 dB
		30 kHz/-50

Audio Output: greater than 2.6 W at 10% distortion into an 8-Ohm load

Notch Filter Attenuation: greater than 45 dB
RIT Range: (±) 9.9 kHz

Transmitter

Output Power:		
	SSB max	100 W PEP
	AM	40
	CW	100
	RTTY	100
	FM	100

FM Deviation: (±) 5 kHz
RTTY Shift: 170 and 850 Hz
Spurious Emissions: less then -60 dB
Carrier Suppression: greater than 40 dB
Unwanted Sideband Suppression: greater than 55 dB
Microphone Impedance: 600 Ohms

Antenna Tuner

Output Matching Range: 16.7–150 Ohm unbalanced feedline
Minimum Input Power: 8 W
Band Switching Time: 3 seconds or less
Auto Tuning Time: 3 seconds or less
Auto Tuning Accuracy: vswr 1.2:1 or less
Insertion Loss: 0.5 dB or less (after tuning)

Alden Weatherchart Fax Recorder

Alden Electronics
Washington Street
Westborough MA 01581
Price Class: $995

by Dr. Ralph E. Taggart WB8DQT

Facsimile, or simply Fax, is the oldest of our video technologies. It has been used since the turn of the century to transmit copies of documents or photographs—first over telegraph and telephone lines and later via radio. All approaches to Fax are geared to send complex images over voice-grade circuits. They accomplish this by sending the information relatively slowly. In principle, they operate like slow-scan TV, which actually was called cathode ray facsimile when initially introduced by McDonald back in 1957. But instead of sending a 128-line image in 8 seconds, pictures with many hundreds to several thousand lines of resolution are transmitted over a period of from 3 to 15 minutes!

"Fax is the oldest of our video technologies."

Today, Fax systems range from systems designed to transmit office documents over phone lines to HF links carrying weather charts and press photos, or the transmission of satellite cloud cover images at VHF and microwave frequencies. In recent years, an increasing amount of Fax traffic is also carried on subcarriers on the satellite TV transponders of the many DOMSAT spacecraft scattered along the Clark Geostationary Satellite Belt. This short introduction will concentrate on Fax systems for HF and VHF/microwave links. Various Fax systems differ in a number of primary features including the image format, video modulation, the basic recorder design, and the nature of the media used.

Image Format

The image format used by a specific system can be expressed as two components—the line rate and the *index of cooperation* (IOC). The line rate is simply the number of lines transmitted every minute. Standard line rates are 60, 90, 120, 180, and 240 LPM. Sixty LPM is rarely used these days because of the longer transmission times. Much press wirephoto activity occurs at 90 and 180 LPM and some countries transmit weather charts at this speed. An almost universal standard for weather chart (map) transmission is 120 LPM. It is used in some satellite links like U.S. TIROS/NOAA and Soviet Meteor polar orbit spacecraft. Standard 240 LPM is used primarily for satellite image transmission.

The scanning rate of a format corresponds to horizontal scanning in a TV system. In addition to the equivalent of the horizontal scanning rate, the equivalent of vertical scanning must also be matched in printing out an image if the copy is to look like the original. Compatibility in vertical scanning is determined by the index of cooperation which is an index that defines the relationship between the width of the copy in inches (W) and the number of lines per inch (LPI) printed by a particular system:

$$IOC = (LPI \times W)/3.1416$$

Regardless of the width of copy printed by a particular system, if the line rate and IOC match, the copy at the receiving end will have the same proportions as the original at the transmitter site. The IOC match does not have to be perfect for acceptable copy but it should be close. Most weather charts are transmitted at 120 LPM with an IOC of 576. If the transmitter is using an IOC of 576 and the receiving recorder is using 288, for example, the received copy will be stretched to twice the proper length. If the transmitting IOC is smaller than the IOC of the receiving system, squashed copy—too short in vertical dimensions—will result.

The line rate and lines per inch of a particular recorder are usually set by synchronous motors, driven from a crystal frequency standard, in tandem with belts, gears or other mechanical linkages. It is possible to make a Fax recorder with multiple line and IOC rates but such machines are mechanically complex and usually quite costly. Most Fax recorders are built for a single line rate and IOC to fit the class of service they are designed for.

Video Modulation

There are two main systems for transmitting the video data, both of which depend on modulation of an audio subcarrier. AM subcarrier modulation was the first to be used and it is still found in VHF and microwave satellite image transmissions. In these systems, the amplitude of a 240-Hz subcarrier is modulated so that minimum amplitude corresponds to black while maximum amplitude corresponds to white. Rf satellite transmissions are made using FM so signal fading is not a problem. This is definitely not the case with HF transmissions,and HF Fax uses an FM subcarrier modulation system. In this system the subcarrier is varied from 1500 Hz for black to 2300 Hz for white.

HF Fax systems thus can use an audio limiter in such FM or FSK modes, and signal fades pose no problems as long as a decent signal-to-noise (or QRM) ratio is maintained. Switchable video systems are easier to implement than multiple line rates and IOC standards. Thus it is more common to find recorders that will handle both video modes, although machines designed for a single service will usually only have one or the other.

Although there are some hybrid approaches, most Fax recorders can be designated as either drum type or continuous feed systems. The drum system is quite simple in that the recording paper is wrapped around a drum (manually or automatically) and the drum is rotated at the line rate. A light gun or stylus is then moved along the length of the drum to provide the vertical scanning. In the continuous feed system, the recording paper feeds from a roll. The printing stylus, either a continuous helix or a belt-driven system, scans across the paper while rollers feed the paper at the proper rate for the design IOC with the final image feeding out of the front of

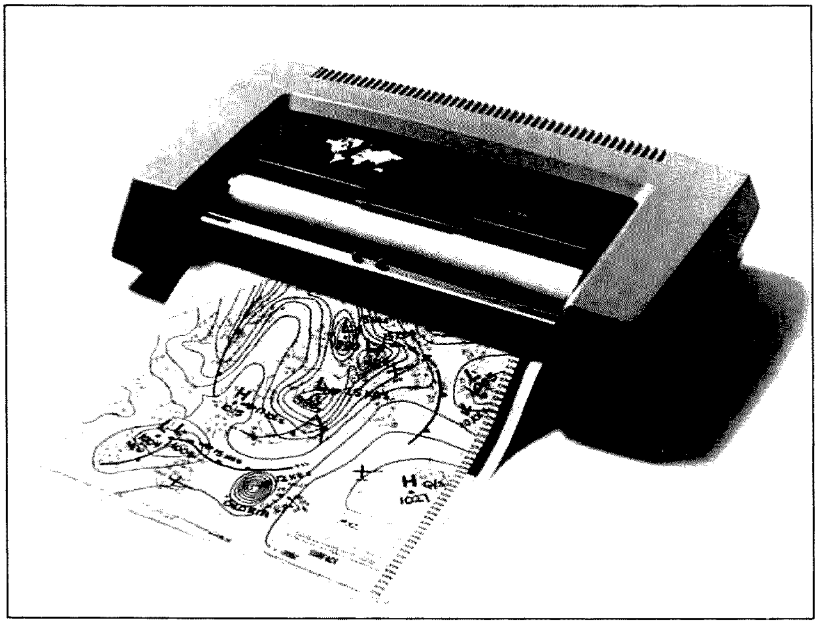

Photo A. The Alden Weatherchart Fax recorder.

the machine. Generally, drum systems tend to be simpler, but continuous feed systems have the advantage of printing many pictures without the need to constantly load new paper.

Recording Media

The paper on which the image is printed generally can be classified into three broad categories—photographic materials, electrostatic papers, and electrolytic papers. Photographic media include photographic film, photographic papers, or various kinds of non-conventional light-sensitive (dry silver) papers. These are exposed with a modulated light source and are capable of the very best halftone image reproduction. In return for the quality, there are a number of disadvantages. The materials must be protected from external light sources during storage, loading, exposure, and processing. All require either conventional wet photographic processing (internal or external) or, in the case of the dry silver media, the paper is run through a set of heated rollers for processing.

Electrostatic papers usually use a wire printing stylus operating at a high voltage (up to 250 V for some papers). The paper has a black base layer and a white surface coating. The printing voltage burns away the white surface layer to varying degrees, ranging from white to black. Electrostatic papers produce a nice grayscale and can be handled in normal room light like any other paper product. The images are absolutely permanent and will not fade or discolor. The two major disadvantages of electrostatic papers are that they do not easily lend themselves to continuous-feed systems, particularly homebrew systems, and they do produce some smoke and odor during the printing process.

Electrolytic papers incorporate chemical compounds which alter when subjected to a flow of current, producing a trace that is proportional in intensity to the printing current. They are used primarily in continuous-feed systems because the paper must be moist in order for the electrolytic printing action to occur. The compartment that holds the paper roll is designed to inhibit drying of the paper. Electrolytic papers tend to be a little fussier in terms of getting a good grayscale. Midrange grays are distinctly sepia while blacks tend to have a purplish cast with most types of paper.

Image permanence is highly dependent on the type of paper used. Earlier formulations tend to fade or discolor but the newer grades of paper are quite a bit more stable. Electrolytic papers are almost universally used in weather chart recorders and are also found in many wirephoto systems.

Sources of Fax Recorders

There are not many options for obtaining a Fax recorder. New machines, particularly those that will handle satellite video formats, are quite expensive. That leaves the options of home construction and surplus! Surplus units tend to be bulky—they have been traded in or sold as part of upgrading to more modern equipment—and supplies of parts and paper can become critical, depending upon the original manufacturer and his policy of supporting older equipment. You *can* build your own and the *WSH*, for example, features a very functional drum-type system using electrostatic paper that gives very good results. Building your own Fax recorder does require a unique blend of circuit construction and mechanical fabrication, and this mix does scare off some potential Fax enthusiasts.

"One of the finest kits I have ever had the pleasure of working with!"

The Alden *Weatherchart*™ Recorder

Alden Electronics of Westborough, Massachusetts, has introduced an exciting new option in the Fax game with the introduction of a kit version of their compact *Weatherchart* Fax recorder. Priced at $995 (plus $5.00 shipping and handling), the kit is more expensive than the homebrew alternative but does offer a commercial grade recorder at a price less than what most folks are spending for dot matrix printers and considerably below the going rate for other commercial recorders.

This magazine, *73*, obtained one of the kits to add to the ham station. The editor called to ask whether I might be interested in putting the unit together and preparing a review. I had seen the unit at several Dayton Hamventions, but I knew that it was basically an HF machine and I had not paid much attention due to my satellite interests. However, I had come up with a rather neat idea in the interim (more on that later) and a look at the Alden system fit in quite nicely. Now, for the focus of this piece—which has taken some working up to!

The unit is completely solid state and is quite compact (9.2 cm H x 43.3 cm W x 26.7 cm D) and operates off the 110-120 V ac (50/60 Hz) mains at a modest 10 W on standby and 30 W while printing. The recorder is designed for 120 LPM with an IOC of 576 (196 lines/inch). The unit accepts subcarrier FM modulation (1500 Hz black to 2300 Hz white). Autostart (300 Hz start tone), auto-stop (450 Hz tone) and automatic phasing are provided. The recorder has black (1500 Hz) and white (2300 Hz) LED indicators for tuning.

The system is a continuous-feed design, accommodating a 35- foot (10.7 m) roll of 11 inch (27.9 cm) wide paper in a unique paper cassette that I will talk about shortly. Each cassette is good for about 30 charts (± depending on the type of chart). Alfax electrolytic paper is used, and the finished charts feed out of the front of the machine with no need for additional processing. The images are said to be permanent.

The Kit

So what do you get for slightly less than a kilobuck? The answer: one of the finest kits I have ever had the pleasure of working with! The unit is built like a tank to the best commercial standards, it's good value for the money, *and* it's made here at home!

The kit arrives in a single, well-engineered carton that makes shipping damage highly unlikely. The box is packed in two layers. The upper contains the manuals, main chassis components, the main circuit board, and two cassettes of paper. The bottom layer features 13 numbered compartments, each with a bagged set of components and each individually foam-wrapped.

The individual or team at Alden that engineered the kit package deserves the highest praise. Alden has been one of the outstanding companies in the Fax realm for years, and it shows in virtually every aspect of the kit. Documentation is voluminous and complete to the last detail. The main construction manual is 36 pages in a heavy-duty looseleaf binder. In addition, you get the 34-page operating manual that normally is supplied with the factory-assembled version plus six different manuals that provide frequency lists and schedules for Fax transmissions for every part of the world. When you finish the unit you will have no lack of information on how to put it to good use.

Assembly

Putting the kit together is a breeze. The two circuit boards are completely wired and tested and require no alignment! The kit itself is complete to the last component, including a supply of solder and heat-shrink tubing. All wires are cut to length, stripped, and tinned. Most of the wiring goes to two Molex® connectors, and those wires have the proper pin connector already installed!

About 75% of the construction consists of mechanical assembly. Most wiring is concentrated at the end, immediately before and after the installation of the circuit boards. One of the things that makes things go so smoothly is the good coordination between the documentation and the parts packages. Each time you turn a page of the manual you are dealing with a new parts package and everything is covered on the spread of the two pages on the looseleaf assembly manual. Each package contains a relatively small number of parts, a factor that makes it easy to keep track of the different components. Ample pictorials, both of parts and assembly steps are provided, so there is no problem knowing what you are to do. Each step is carefully explained, and you have a checkoff box for each step to mark your progress.

The control panel with all of its switches and indicators is wired as a single assembly. At the very end it will be interfaced to the main board via a header cable and to the mainframe wiring via a Molex connector. The rest of the mainframe wiring comes into another Molex connector which plugs into the main circuit board. A small circuit board for the marking power supply and amplifier connects to the main board via a cable that is already in place on the smaller board. In short, there is very little opportunity for error.

Construction took about 6 hours spread over two evenings—including a number of leisurely coffee breaks. Had I been building it for myself, I probably would have finished in

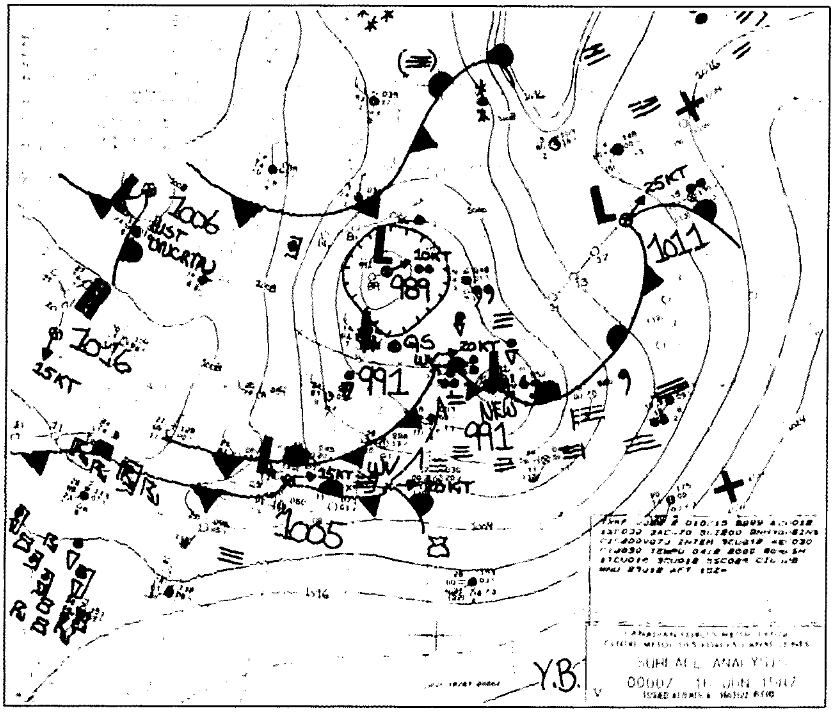

Fig. 1. Sample weather chart.

one long evening! The work, oriented around the individual parts packages and exemplary documentation, proceeds so smoothly that the project is done about the time you begin to wonder where the hard parts are going to be!

Checkout and Operation

Final checkout is quite simple since the boards themselves are pretested and aligned. Most of the checks involve the use of an ohmmeter to be sure that you haven't made a wiring error that will generate smoke! Once that is assured, do a few basic operating checks to assure yourself that the stylus belt is moving in the right direction and that the paper-feed rollers are operating—and you are ready to print a picture!

The Alfax™ paper is contained in a semi-flexible plastic cassette that is clear so you can see how much paper remains. The grounded printing blade is a part of each paper cassette so you need not worry about this part wearing. Alden suggests replacing the stylus belt with every 6 cassettes of paper. If you order their paper in boxes of 6 cassettes (Stock Number CB1135J-K1, $39.95 plus $3.00 shipping and handling), you also get a stylus belt assembly with each box. A box of two cassettes (without a stylus belt) costs $9.40 and the stylus belt goes for $15.00—so you do save with a six-pack. I should note that the kit includes an extra stylus belt. In the unlikely event that you damage the first one, you do have a spare.

Paper loading consists of lifting the pressure roller assembly at the front of the machine, followed by insertion of the paper cassette. You should pull a little paper from the cassette prior to installation and verify that it feeds out smoothly. Both cassettes packaged with the kit were very stiff in terms of paper feed and the feed assembly could not pull the paper out properly. In both cases, I had to manually pull the paper out until the paper would feed smoothly. I had a chance to use two cassettes from a fresh package of six and neither of these had the same problem. I suspect the difficulty occurs with the paper packed with the kit because it may be sitting unused for an extended period.

Most Fax transmissions are made on upper sideband. Between charts, the stations will be transmitting a white (2300 Hz) tone. In such a case you should tune the receiver to the proper frequency and adjust the tuning so the white LED comes on. Assuming the recorder is on, the system will begin printing with the receipt of a start tone and will stop automatically at the end of the chart when the stop tone is transmitted. During the chart transmission, the black and white LEDs will alternately flash with the pattern depending on the type of picture being transmitted. The operating manual clearly shows the various possibilities—tuning in on a Fax transmission mid-chart is quite easy with a little practice. In such a case you will have to use the START button on the front panel to initiate printing and use the FRAME switch to properly phase the picture.

Results

Although I have two ham-band-only transceivers, my general coverage options are limited to a Panasonic rf-4800 receiver covering 3–30 MHz in a slew of bands. This receiver does have digital readout but it is *not* synthesized and it drifts like mad! The CW/SSB option is supported by a variable bfo, an arrangement that will be fondly (?) remembered by many old-timers. The bfo also drifts! Given this superb receiving arrangement, I really didn't think I would be able to copy any weather charts without borrowing a receiver—but here I was, late in the evening, with a completed Fax recorder and the equivalent of a digital-readout crystal set. What the heck!

Imagine my surprise when the Alden machine actually did deliver some quite acceptable charts! Most of the time I had to sit there tracking the bfo to try and maintain the same flashing pattern on the LED tuning indicator. And imagine my surprise to actually see the recorder auto-start and auto-stop and actually print a chart in between! Numerous charts were copied from NAM, the U.S. Navy Fleet Broadcast station out of Norfolk on 3357, 8080, and 10865 kHz. Charts from CFH in Halifax were also copied on 4271 and 6330 kHz. If I were to get seriously involved in HF chart activity, I would probably build a receiving converter for use with one of my HF transceivers to get the required stability for long-term unattended operation.

In operation, the recorder is fairly tolerant of incorrect tuning. In part, this is due to the sharpness of the video transfer function—the system tends to want to print either black or white and the transition between the two is fairly abrupt. This is another way of saying that the unit does not print a good continuous grayscale in normal operation. I don't really mean this as a criticism since Alden designed the unit for weather charts and they don't even imply that it should be used for halftone reproduction. The video characteristics are ideal for preventing unwanted shading of charts due to mistuning, and that is how they expect the system to be used.

One problem that did arise during early printing sessions was a stubborn tendency to tear the moist recording paper along the right margin. At this point pressure is applied to the cassette blade where the edge of the paper passes over a small metal tab known as the stylus ramp. This metal strip is designed to deflect and stabilize the stylus as it comes around just prior to its track across the paper. Endless tinkering established that the metal stylus ramp was basically too thick and was causing the blade to press down too hard on the paper at the point of contact, resulting in a tendency for the paper to tear. In exasperation I finally removed the metal ramp strip and installed a thin plastic strip, trimmed to the same size as the original, which I cut from a plastic component bubble-pack. I taped the plastic strip in place from the rear using a bit of transparent tape and the strip worked perfectly—no more tears!

I was quite surprised a few days later, when unpacking a six-pack of cassettes, to find a little envelope packed with the stylus belt marked "Replacement Stylus Ramp." It was a strip of thin plastic! Apparently some of the kits were furnished with a metal ramp while later versions use the plastic. The replacement was a dead ringer for the one I had made and should cause no tearing problems. If your kit has the metal ramp (it's one of the first parts

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Microwave Building Blocks: The Doubly-Balanced Mixer

WB6IGP adds another piece to his puzzle.

This article describes a high-performance doubly-balanced microwave mixer that you can construct. This can be used in a downconverter giving good isolation between all ports—unlike the relatively poor performance of the singly-balanced mixers. The operating frequency range of this mixer can be any frequency up from 500 MHz, depending on the size and scaling of the device.

I wanted to build a system for single sideband on 1296 MHz but didn't want the unit to be purchased or locked into a design in which the components could not be used in another project. I wanted the components to be universally adaptable, and that required a building-block concept with all units connected with coax. In this way, as I worked toward my goal, each unit of the project would be constructed and tested by itself and could be used in another project if I desired.

The use of doubly-balanced mixers is not new and there are many available. The most common of them are the little eight-pin packs available from several manufacturers such as Anzac (MD-108), Mini Circuit Lab's (SRA-1), and Relcom (M6F). I have been able to obtain and use all of these units and find them excellent in their application. The devices exhibit very good isolation between all ports, keep spurious responses to a minimum, and, having a slightly higher conversion loss than singly-balanced mixers, require an amplifier following the mixer. This is a very small price to pay for the performance they give. See Fig. 1 for details.

One deficiency is the lack of units that give the same performance in the higher frequency range above 500 MHz. The lack of availability of this type of reasonably-priced mixer was the prime reason for starting this project. First, I built several types of mixers (singly balanced) to be able to gain some insight into what was needed. The first design that I tried was a Rat Race mixer, which looks like a stop sign. I tried everything to make that design work but had little luck. I then tried the Rat Race mixer that resembles a rectangle that is similar to the stop-sign mixer tried previously. This rectangular Rat Race mixer worked as advertised. This was the mixer that was used in the 1296-MHz stripline transceiver in the 1985 *Handbook*. See Fig. 2.

No project is a loss, and the stop-sign Rat Race mixer taught me several things about striplines, the method of running them, and the discontinuities you can have if you run the lines at a sharp angle. I found out that by mitering (slicing off) the sharp edge at the right angle junction, you improve the impedance transformation around the bend. If you leave the junction with a sharp edge, you will see a sharp spike in the standing

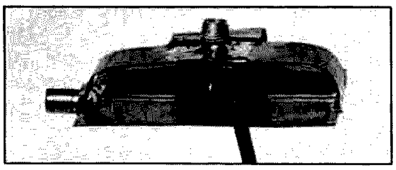

Photo A. Mixer front view showing diode placement and common ground strap.

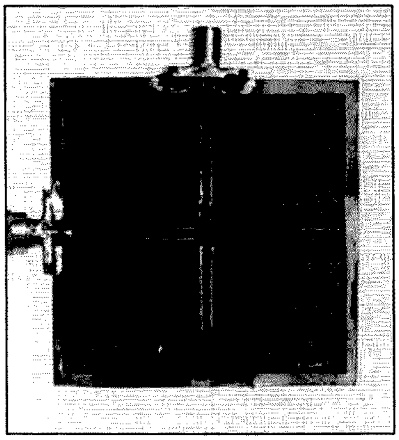

Photo B. Mixer rear view showing jumpers with insulation required for tuned lines.

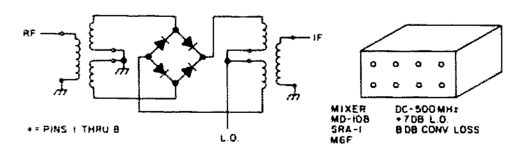

Fig. 1. Common doubly-balanced mixer design for Dc–500 MHz.

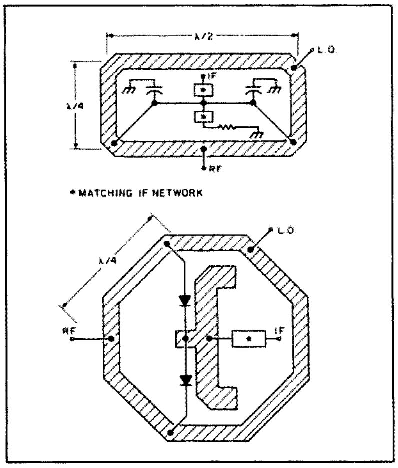

Fig. 2. Rat Race mixers 1.3 GHz (not to scale).

wave at the junction (a rather large discontinuity). There is a ratio to determine how much you should slice off, but, not being a purist, I elected to remove about 25% of the junction and it seems to work out OK. An alternative method is to use rounded bends with a radius of three to four times the stripline width. See Fig. 3 for details on the junction mitering.

PC Board Materials

There is a field full of printed circuit board materials to choose from, including paper, epoxy, fiberglass, Teflon™, and ceramics. Each has a different dissipation factor and dielectric constant depending on the material used as the host for the copper substrate. Paper is not a good choice, since it acts as a wick which absorbs moisture from the surroundings, which eventually ruins the dielectric. Epoxy and fiberglass are good board materials, and the G-10 variety glass epoxy can be used up to the 1-2-GHz microwave bands with reasonable results. Almost all printed circuit boards used today use a good quality glass-epoxy. It has a dielectric constant of about 5.5.

The next upgrade in printed circuit board material is Teflon or Duroid. Both types of board have a dielectric constant of about 2.2 to 2.5 and are excellent selections for use at microwave frequencies. They offer excellent dimensional stability in high-temperature and high-humidity environments without affecting the board. They are also very resistant to solvents and chemicals.

By the way, if a board states it has 1/2 oz. of copper, it means that the PC board has a .0007-inch-thick layer of copper on one side (1 oz. of copper equals approximately .0015-inch-thick copper; 2 oz. equals approximately .0020-inch-thick copper). Also, the copper is not applied to the Teflon with adhesives or glue, but is pressed on with heat and considerable force; it does not come off once pressed!

With all this now in firm grasp, I proceeded to construct the 3-dB hybrid mixer. This unit looks somewhat like a figure "H" lying on its side with a large square hole in its center. This mixer was the first successful hybrid type that I constructed (see Fig. 4).

This mixer consists of three sections: the input coupler, the diode array, and the i-f matching network. I have used this mixer in a lot of designs, the most recent being the 1296-MHz ATV receiver (October, 1985, *73 Magazine*). I also used the same mixer design in a receiver for 2300 MHz and 4200 MHz. I never had a failure with this design and am very impressed with it.

To sum up the performance of the singly-balanced mixer, it is easy to construct and a proven performer. The design uses few components and requires a lower-level local-oscillator power injection. However, the one drawback is that the isolation between ports is poor. Local-oscillator energy can be reflected into the rf port and all sorts of things can happen, such as spurious responses.

Although it created problems of its own, the next mixer I tried proved to be the best overall. The design was first noted in a piece of surplus scrap that was torn apart to see what was going on inside. It was intended for 8-10 GHz, but the principle of its operation remains the same. The unit used two crossed lines looking like a tuning fork with another pair of crossed lines identical to the first. They were constructed on very thin Teflon PC board about .003 inches thick (the thickness of a piece of paper). The orientation of the two crossed lines was at 90 degrees with a 50-Ohm stripline tied to the input of each of the tuning-fork-like striplines. There was a third thin PC board that had four quarter-wave striplines that looked like a four-leaf clover, and at the junction of the quarter-wave stubs were four diodes alternating (anode, cathode, anode, cathode) connected to the stubs.

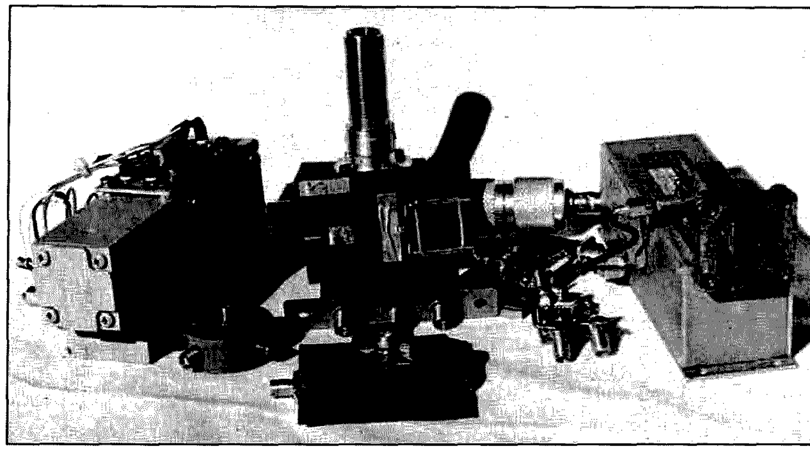

Photo C. A collection of the "building blocks."

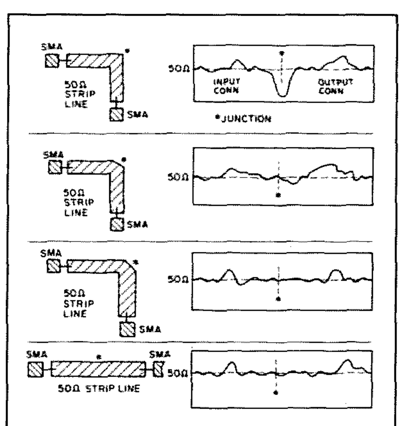

Fig. 3. Stripline junction mitering.

The common point of the four diodes was tied to a stripline for coupling into the device, and Eureka!—a doubly-balanced mixer. One friend's suggestion led to the final design of this mixer: Place it on one single piece of PC board with both striplines (the tuning-fork-looking guys) on one side and the four stubs on the opposite side of the board.

This simplifies the design over the original three-PC-board construction, and makes it easier to reproduce. I located a few pieces of .010" thick Teflon fiberglass material and laid out the mixer design. Even though I use the photographic process to reduce my hand-drawn artwork to proper size, other methods are available. The dimensions for the striplines are: on the diode side, all lines are .100" wide. For the other side (the tuning forks), the line width is .010"-.015" inch; at the point of connection to the coax connector, line width is .025"-.030".

If you use larger values in the etching, you will most likely have some undercutting producing something near the correct dimensions. Not being a purist, I find that you can violate lots of rules, but by not straying off too far, you still can have very good results. I do not have all the instrumentation at my disposal to find out all of my faults; I let performance prove out operation.

One method to make your own PC board is to place masking tape cut to the desired width on the PC board where you want the copper to remain. There is also PC artwork tape that comes in pre-cut widths. This is recommended for lines that are .010" thick. I use the Bishop Graphics PC tape, and it has worked well on these fine lines in early prototypes.

Lay out the tape and press it onto the copper surface firmly, being careful to cover all ar-

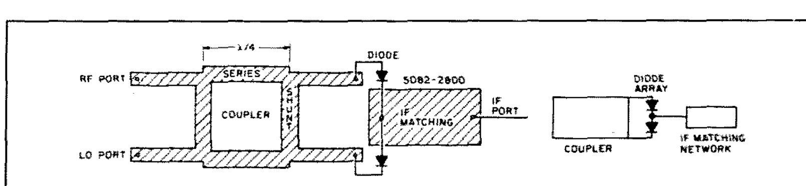

Fig. 4. 3-dB hybrid mixer.

eas you want to protect from the etch. Where you must overlap tape, press lightly with your fingernail on the overlap to reduce any air gap that etch may flow into and undercut the board. Check your tape carefully, as you want none of the tape to fall off in the etch. If it is pressed on firmly but not hard, it will hold. Also, don't press too hard with your fingernail, as this could deform the soft Teflon. I suggest that you use new ferric chloride so that the time in the etch will be at a minimum.

A variation of the above would be to cover the two sides of the board with a short piece of two-inch-wide tape. Lay out the pattern with a pencil and cut the lines with an X-acto™ knife, removing the pieces of tape where you want the copper to be etched away. Do not use hard pressure, or the knife will deform the PC board. See Fig. 5 for details, and Fig. 6 for the artwork for a 1.3-GHz mixer design.

I used several varieties of Hewlett Packard Schottky diodes in the mixers. The 5082-2800 (1N5711) family is available at Radio Shack. The 5082-2835 is a better choice, but could be a problem to find. Some of the mail-order houses have them in stock.

Each diode is mounted to the bottom of the stripline quarter-wave stubs at the junction. The diodes are mounted in an alternating fashion: anode side down, anode side up, anode side down, and finally, anode side up. The opposite sides of the four diodes are tied common, and together they form the i-f output port. It does not matter where you start placing diodes if they are uniform, matched, and alternate around the quarter-wave stubs. I mounted a wide strip of copper from the common foil (both sides' foil tied common) ground edge strip up over the i-f port coaxial connector and on to the opposite side ground foil, to provide a good ground return for the i-f port. Final assembly can be into a small metal box with the i-f port connector fixing the assembly in place. Then the other two connectors can be mounted on sides adjacent to each other at the flange end of the stub lines. Solder the flanges to the ground foil and the center pins to the terminus of the stripline couplers (the tuning-fork-looking guys).

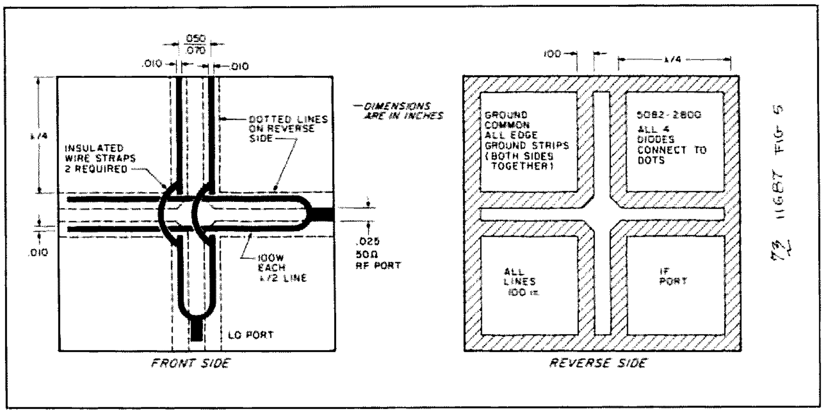

Fig. 5. Doubly-balanced mixer (not to scale).

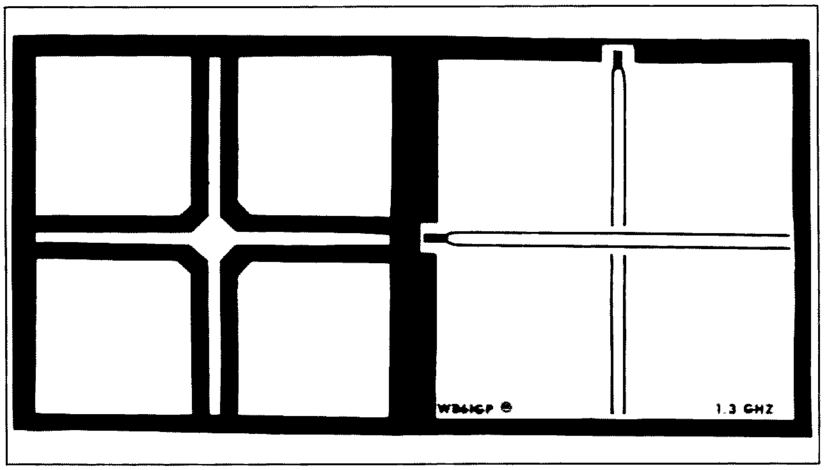

Fig. 6. Artwork, 1.3 GHz mixer. 1:1 scale.

Checkout/Operation

If the diodes are good and there are no solder bridges, the mixer should work without adjustment. Bandwidth for usable performance, according to the textbooks, is plus or minus 500 MHz, or 800 to 1,800 MHz. I tried the mixer out on 450 MHz because I have two calibrated signal generators for this band. I supplied 600 MHz at +8-dB injection into the LO port and connected the i-f port to my two-meter radio. Connecting my test signal generator to the rf port, I set it for 450-MHz input and found that I could reduce the power to the .2-uV level for very near full quieting on the two-meter i-f. Attaching a 450-MHz antenna, I was able to copy many repeaters and even tune up into the commercial band. It performed well.

I tried the mixer out with my trusty old klystron-powered 1.3-GHz signal generator and the results were much the same. Stability was poor, but that was due to the fact that the injection oscillator was free-running and drifting. However, that was the only source at the time that would drive the mixer with the required +8-dB LO injection. The sensitivity was 1 uV, but I believe part of that was in the loss of the coaxial cable used to connect to the input of the mixer. So far this is the most sensitive test that I have performed at this frequency.

I hope that those who undertake this project will find that this mixer is quite a performer and will serve many different uses. I plan to use the mixer in SSB converters for 1296 and 2300 MHz. There have been many articles on rf amplifiers. The device following the mixers will be one of the broadband amplifier modules. I have used the MC-5121 and the MWA-110/120-type monolithic amplifiers and they have worked for me in the past. Just remember to keep the i-f port terminated in 50 Ohms and you will not have any trouble with this or any other mixer.

One point of operation that I did not mention and have not tried is using the mixer in an upconversion mode, using the i-f port as an input, keeping the LO port for injection, and now using the rf port as the output source for driving an amplifier chain to drive a final stage.

This mixer is something UHF experimenters can play with and expand upon. As always, I would be happy to answer any questions concerning this project and other related items. Please enclose an SASE for a prompt reply.

If you are unable to obtain the double-sided Teflon PCB stock, I can provide the .010″-thick double-sided board for $5.50 U.S. postage-paid, or 5 pieces for $20 postage paid, in the U.S. It is available in other sizes up to .062 inches thick. I can also help out with the diodes if you can't obtain them locally; Radio Shack used to have them. ■

References

1. "Stripline 1296 Microwave Receiver," *73*, October, 1985.

2. *The Radio Amateurs Handbook*, 1985.

3. Relcom/Watkins Jennings, 2525 N. 1st Street, San Jose CA.

4. Anzac Electronics, 39 Green Street, Waltham MA 02154.

5. Mini Circuits Lab, 2625 E. 14th Street, Brooklyn NY 11235.

6. Radio Society of Great Britain *VHF/UHF Manual*, Chapter 4.

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Everyman's Microwave Amp

An inexpensive conversion for 23cm.

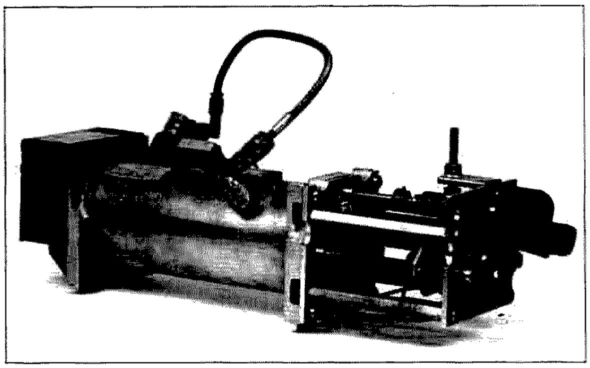

Photo A. An unmodified Adler UHF cavity. The input is visible to the front of the cavity wall and the output is to the rear.

The theme of this month's *73* Magazine deals with cheap and easy ways to get on the frequencies above 900 MHz. After a lot of head scratching, I found a likely subject sitting on the shelf above my operating table, and will now enthrall readers with tales of a cheap amplifier for the 23-centimeter band that requires minimal modification, a simple power supply, and a few hours of your time. The catch? The cavities are not the easiest parts to find . . . but read on.

Some time ago, the Adler Electronics Corporation of New Rochelle NY manufactured a device consisting of three tuned cavities—two operating as power amplifiers, and one as a mixer. The eventual operating frequency was above 1300 MHz with power levels in the 100-watt range. The actual cavities used employed a 2C39A tube in a compact, grounded-grid design, using a plunger assembly for tuning. These cavities went under the identification number #6553-603B9, and a representative unit is presented for your viewing pleasure in Photo A.

The cavity is to the rear with the short Teflon coax extending from the housing. Controls for plate tuning and loading are at the front and employ reduction gearing as well as a chain drive to allow somewhat smooth tuning. No input circuit was employed for the cathode—indeed, the typical swr of one such cavity is pretty awful, on the order of 4:1 or worse! But, tubes being what they are, the impedance mismatch didn't matter much. Nominally, the amplifier functions at about a 10-dB power level, with a maximum rating of about 100 Watts output.

Steve Katz WB2WIK has modified these cavities in the past, and recently located another mixer/amplifier assembly that he had stashed away some years earlier. I suggested that another conversion might be in order, and away we went! The most important part of this conversion is to lengthen the cavity by increasing the plunger's tunable range. The simplest way to do that is to install shims at the points where the plunger assembly attaches to the cavity—allowing the plunger to pull out a bit further and make the resonance point of the cavity drop in frequency.

Photo B shows where the shims are inserted. A pencil points to one of the four holes where a standard 8/32 nut has been slipped over the attaching screw. This is repeated at each of the other three corners. Use care when removing the screws! You don't need to pull the plunger assembly out—just the screws, and only far enough to insert the shims. (Told you this was easy—so far!)

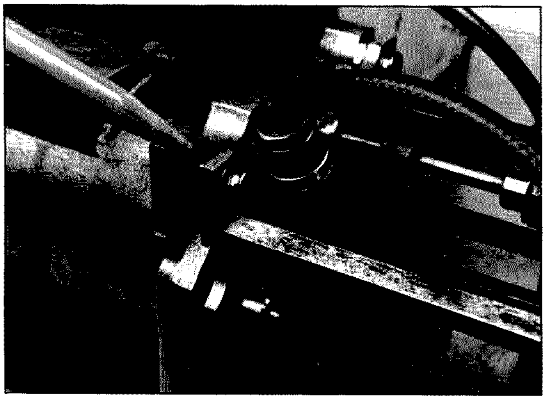

Photo B. The pencil shows where to insert the 8/32 nut shims to extend the length of the cavity. A total of four shims is used.

File and Fit

One problem which will become evident right away: You won't be able to re-attach the TNC connector to the cathode input line. The solution is simple: Get a strong flat file and determine the final position of the connector when installed. File the side closest to the cavity as flat as possible without filing through the wall of the barrel. Reinstall the connector, then install the shims. It'll make for a snug fit! The supplied connectors are made from silver and file quite easily.

What you've now done is to allow a tuning range down to about 1295 MHz (whereas the original tuning cut off at about 1300 MHz) and will be able to see a definite dip at resonance. After you've refastened the plunger assembly, the mechanical work is done and a suitable power supply must be concocted. There are only three voltages required—6.0 Vac for the filaments, 1000 Vdc for the plate, and an adjustable source of 8–20 volts for the cathode. This latter source is the bias circuit and sets the plate current, determining the class of operation.

When you obtain the cavity, you'll notice three connections: two wires from the front side of the chassis, and a connection near the tube anode to the chassis rear. The first connection is for the cathode/filament of the tube, and the rear connection for high voltage. The filament chokes are already in the cavity assembly as is the plate choke, so connections to the high voltage and bias supplies are a snap.

Figure 1 shows a suitable supply. Zener diodes can be used in a string to set the cutoff bias. This way, the addition of a phono jack to pull to ground part of the string will set the correct operating voltage. Photo C shows a completed amplifier with front panel plate current meter, power switch, and indicator lamp. The filter capacitors in the HV line aren't particularly pretty, but are surplus GE Pyranol types, each rated at 4.0 uF at 2000 Vdc. They only cost \$2.00 apiece from a surplus outlet, and the HV transformer set me back about \$7.00. It's rated at about 800 volts CT and 400 milliamperes—plenty hefty for the job.

NOTE: Many surplus oil-filled capacitors were manufactured with an oil containing Polychlorinted Biphenyls (PCBs), a potentially lethal compound and proven carcinogen! If you have any doubts about oil-filled capacitors of indeterminate origin, PLAY IT SAFE and select computer grade units. You

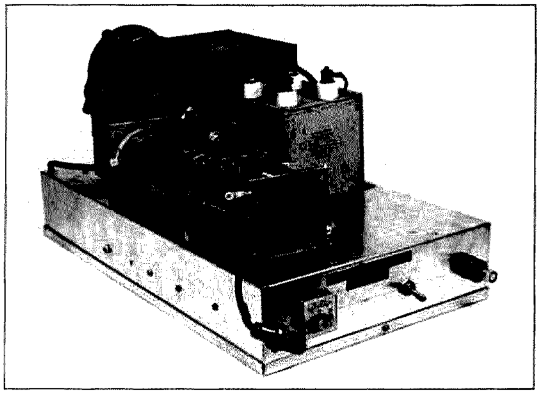

Photo C. View of the completed amplifier and power supply chassis. The space to the right of the cavity is used for a Bird 43 wattmeter and coaxial relay.

can gang these in series to obtain the required capacitance/voltage rating.

The full-wave bridge should use diodes with a hefty rating. They should be able to handle 1.5 kV at about 1 amp, but in this model, two 1N4145BD devices were employed in each leg to achieve that purpose. Photo D shows the underside of the completed amplifier with the HV rectifiers to the upper left. HV transformer terminals to the lower left, and the bias/filament transformer to the upper right.

The Filament Connection

A string of 5 conventional silicon diodes (1N4004 types) are used to raise the cathode above ground by a total of 2 volts. These are connected in series with the center tap winding of the filament transformer. Two 8.2-volt 1-watt zener diodes are then connected from this point to ground to establish the standby bias of +18-20 volts. By grounding the junction between the two zeners, the bias drops to about +8-10 volts which should result in about 50-60 mA of plate current on standby.

The high voltage bleeder resistor is located on the upper edge of the chassis. The value is not critical; this particular resistor was a 20-k 40-watt unit. Any junkbox unit between 20 k and 100 k will do—the higher values will just result in smaller bleeder current. Incidentally, the original cavities come without any blower! This is very important, so root through your junkbox or the next flea market to find about a 3-4 inch diameter squirrel cage with about a 1" exhaust port.

Use a good strong epoxy to fasten this port on the top rear of the cavity. There's about a 1-inch square hole here allowing access to the fins of the tube, and a small squirrel cage blower will keep the tube nice and cool. I tried 5-minute epoxy and let it cure for 24 hours. The bond hasn't cut loose for over a year and has survived three portable contest operations.

In actual use, the power output will vary anywhere from 60 to 100 Watts with 6 to 10 Watts of drive. As stated earlier, the input circuit doesn't look like 50 Ohms, but this wasn't critical in the original design as one cavity drove another and there was power in abundance. If you use this amplifier with a solid-state final, you might find the efficiency somewhat worse—most likely due to the ALC circuit protecting the transistors as it senses the high swr.

A useful gadget here is a 50-Ohm line stretcher, which is nothing more than a 10-inch piece of 50-Ohm rigid line with two sliding taps on it—a matching transformer of sorts! Mine came via Steve who found it at a flea market for under $10. I adjust the two taps for maximum power output on the exciter (a result of a good match) and am able to drive my amplifier to 80 Watts output with 8 Watts of drive. If you can't find a stretcher, you'll probably see only 6 dB or so of amplification, but that will yield 40 Watts for 10 Watts of drive...useful in any application.

In Conclusion

One last point—it's imperative that you use a good 50- Ohm relay at the output. Dow Key relays with type-N connectors will do the job very well. A DK-77 with BNC connectors has a bit more through-loss but is cheap—typically $10 apiece at flea markets—and will suffice. I use a brand new Dow Key model 260 which was extremely expensive. Here's a relay that sold for under $25.00 15 years ago and now retails for $200!! Oh well, when you've got the franchise....

Now the catch: finding a cavity. These assemblies originally came from Fair Radio Sales and they have been known to pop up at flea markets from time to time. I have seen such units at Dayton in the past, but rest assured they don't sit on flea market tables for very long! Knowledgeable UHF types gobble 'em up right away, since one chassis yields two amplifier cavities and one mixer cavity. If you happen to find a mixer cavity, simply terminate the unused port with a 50-Ohm pad or load. Microwave loads are easy to find and will cost about $5-15 dollars each.

All in all, the Adler UHF Cavity will yield solid performance on 1296. Suggestion: Replace the 2C39A with a 3CX100 (if the cavity didn't already come with one) for a bit more output. Don't use 2C39s, as they are glass tubes and performance falls off drastically at this frequency! Both 2C39A and 3CX100 types are ceramic triodes and carry full ratings to 2 GHz, but the 3CX100 has a bit higher plate dissipation rating. You can find them at flea markets for a reasonable sum. ■

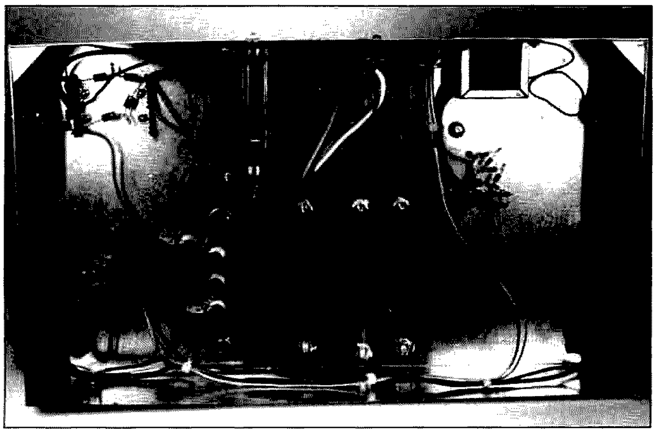

Photo D. View of the chassis underside.

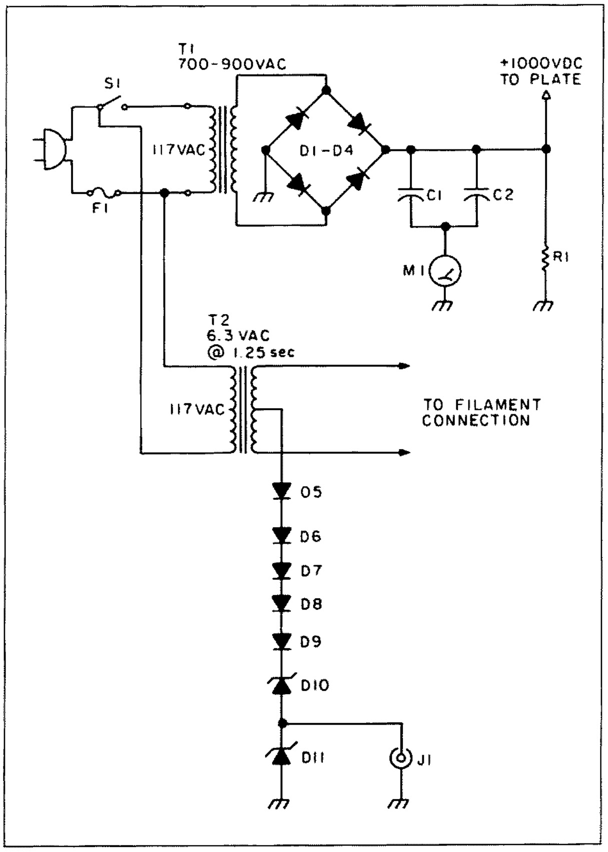

Figure 1. Power supply schematic.

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Linear IC Amps

Using them without abusing them.

In 1966 I worked as an electronics technician repairing stereo amplifiers and receivers. One day, while working on an H.H. Scott receiver (one of the better brands in those days), I came across a series of semiconductor components in the FM i-f stage that looked funny. They looked like plastic epoxy transistors with six bug legs sticking up in the air. At first perplexed, my mind snapped into gear as I remembered an article on the then-new integrated circuits (ICs). What I was looking at was one of the earliest examples of a uA-703 i-f/rf gain block IC device. Shortly thereafter I discovered the first IC operational amplifier, the uA-709 (which cost $80 then, and goes five for a buck now). The uA-709 was truly revolutionary.

There are few who would argue that the integrated circuit has not revolutionized the entire electronics industry. Virtually unknown a couple of decades ago, the IC chip brought us both the extreme miniaturization of electronics circuits and previously unheard-of component densities. It is unlikely that the miracles of modern electronics—from cardiac pacemakers to the moon-landing program; from consumer entertainment electronics to the most massive fifth-generation supercomputers; from VCRs to multi-talented ham rigs that work from dc to daylight and cram more capability into a lunch box than we old guys put on a whole desktop—would have come into existence without the little chip.

Device performance was also improved by IC construction. Let's consider thermal drift of dc amplifiers. Even low-cost modern IC operational amplifiers are several orders of magnitude better than traditional vacuum tube or discrete transistors models because all of the semiconductors and internal resistors (the main sources of drift) share the same thermal environment in ICs. In discrete circuits, those components are spread out over several square inches of circuit board and thus do

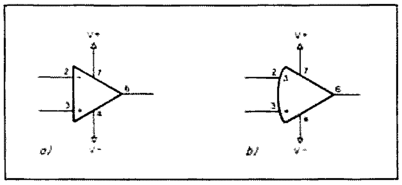

Fig. 1 Standard op amp signals.

not share the same thermal enviroment—so drift is more pronounced than in the IC version of the circuit.

Low cost is another great advantage of the integrated circuit. Early transistor and vacuum tube operational amplifiers were not only larger and ran hotter than their modern ICcounterparts—they were more costly as well. In addition, those early amplifiers only poorly approximated the performance of the ideal textbook version of the amplifier. Modern IC operational amplifiers come so close to

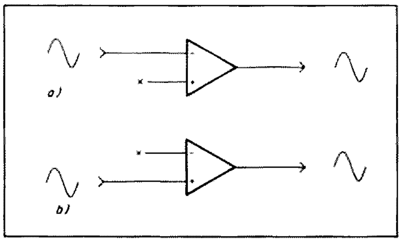

Fig. 2. a) shows inverted output; b)'s output is noninverted.

the ideal (especially premium types) that textbook authors no longer look like fakers to those readers who try to translate theory into workbench practice.

The first ICs appeared in the mid-1960s, and were low-density devices (the uA-703 mentioned above, for example). But as industry learned the trade, the number of active devices on the chip skyrocketed. Today, medium-scale integration (MSI) and large-scale integration (LSI) are the norm—and superscale-integration devices loom on the horizon as the frontiers of technology move forward under the onslaught of the quantum cooks of Silicon Valley.

Operational Amplifiers

The operational amplifier (OA) is the most commonly used linear IC amplifier in the world. Originally, the first vacuum-tube OAs were designed to calculate mathematical operations in old-fashioned analog computers, hence the name operationa amplifiers sticks today. The IC form of OA today is so widely used that it no longer has any significant role in the all-but-obsolete analog computers of yesteryear. The range of other applications for the OA is, however, truly awesome—it has become a mainstay of more audio, communications, TV, broadcasting, instrumentation, control, and measurement circuits than anyone can imagine.

The circuit symbols for the operational amplifier are shown in Fig. 1. The symbol shown at (a) is by far the most commonly used, and will be used here unless otherwise specified. This same symbol could also be used to represent any amplifier with differential inputs, but here will be used as the only proper symbol for op amps. The symbol shown at (b) is also seen occasionally, and some people regard it as the only proper symbol for operational amplifiers. The IEEE standard for circuit symbols, as well as industrial semiconductor companies such as Burr-Brown Corporation, specify the symbol shown at (b).

There are two input pins on the typical OA. The inverting input (-) produces an output signal that is 180-degrees out of phase with the input signal—see (a) in Fig. 2. Here we see a positive input signal producing a negative output signal, and vice versa. The nonin-

verting input (+) produces an output signal that is in-phase with the input signal—(b) in Fig. 2. In the various applications shown in this article we will use either or both inputs.

An amplifier that uses only the inverting input is called an inverting follower, while the amplifier that uses only the noninverting input is called a noninverting follower (why the term follower is used no one under sixty seems to remember—and quite a few over-60 people probably never knew). An amplifier that uses both inputs might be a summer amplifier in some cases, but it is more likely a differential amplifier. That is, it produces an output signal that is a function of its gain and the difference between two input signal potentials.

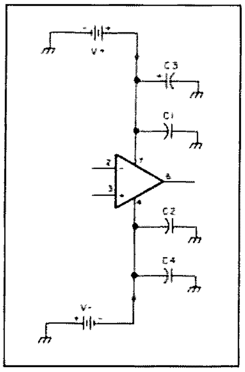

Fig. 3. Op amp powered by a bipolar dc supply.

The operational amplifier normally operates from a bipolar dc power supply, such as shown in Fig. 3. (The pin numbers in this figure are for the so-called industry standard 741-device.) This circuit shows that the two dc power supplies are independent of each other. The V+ power supply is positive with respect to common (or ground), while the V− supply is negative with respect to the common. The operational amplifier manufacturer will specify minimum values for V− and V+. Typically, the maximum voltages will be on the order of ± 18 volts, with some offering ± 22 volts. (In one case a ± 40 volts was advertised.)

It is reasonably easy to supply a missing potential.

There may be certain limitation on the maximum supply voltages that do not show up at first glance, especially in the short-form specification or data sheet that hobbyists are usually given. For example, the most common limitation is the (V−) to (V+) potential. The manufacturer will specify that the quantity (V+) − (V−) does not exceed a certain potential. On some 741 devices, for example, the V− and V+ ratings are both 18 volts. But that does not mean that the algebraic sum of the two is 36 volts! The pin-to-pin supply voltage is not to exceed 30 volts. Since (+18 V dc) − (−18 V dc) is 36 volts, operating both terminals at their maximum voltage is not permitted.

Let's look at a practical example. Suppose we wanted to operate V+ at 18 volts. What, then, is the maximum value permitted of V− that will not exceed the pin-to-pin limit?

$(V+) - (V-) = 30$

$(+18\ V\ dc) - (V-) = 30$

$-(V-) = 30 - 18$

$-(V-) = 12$; therefore

$(V-)max = 12$.

Because most practical circuits operate with equal bipolar dc power supplies, it is also true that most of those using popular operational amplifiers with the 30-volt limit also limit the V− and V+ dc power supplies to not more than 15 volts each.

Single Supply Operation

The operational amplifier is intended for dual or bipolar power supply operation. There are, however, many applications where only one polarity dc power supply is available. In order to operate the op amp in these cases we must either supply the missing potential or devise a method for getting around the need for the missing potential.

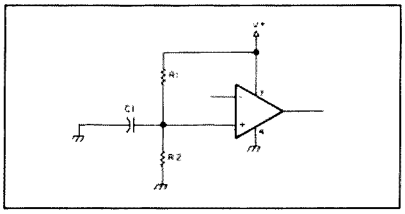

Fig. 4. Voltage divider circuit to power an op amp with a single supply.

It is reasonably easy to supply a missing potential. All we need is to add a dc-to-dc converter circuit that provides the needed voltage from the existing voltage. There are quite a few devices on the market that will produce either −15 volts from +15 volts (or 12 volts, as the case may be), or will produce isolated ±15 volt potentials from an existing non-isolated +15 volt potential. A popular version of this type of circuit is seen in hobbyist magazines from time to time. It uses a 555 IC timer device operated at or near 100 kHz, and a rectifier/filter circuit to produce a negative voltage. Of course, a voltage regulator can be added if needed. Typically, negative regulators will be on the 79xx or LM-320-xx series.

Another method for using a single dc power supply is shown in Fig. 4. Here we use a resistor voltage divider, R1/R2, to bias the noninverting input of the operational amplifier to some potential between ground and V+. The V− terminal of the op amp is grounded. The bias voltage on the noninverting input also appears on the output terminal as a dc offset potential. Unless the following circuit somehow doesn't care about this offset potential, the output must be capacitor coupled. The value of the bias voltage is found from:

$$V1 = \frac{(V+)\,R2}{R1 + R2}$$

The capacitor shown in Fig. 4 is used to place the noninverting input at our near-ground potential for ac signals, while retaining the dc level produced by the resistor voltage divider. This capacitor sometimes causes noisy operation of the op amp, so is often omitted in practical circuits. The value of the capacitor is such that it has a capacitive reactance of less than R2/10 at the lowest frequency of operation. For example, if the amplifier is designed to work down to 10 Hertz, and the value of R2 is 2200 Ohms (a typical value in real circuits), then the value of C1 must be such that it has a reactance of 220 Ohms or less at 10 Hz. This requirement evaluates to:

C1 = 1,000,000/(2 And F X)

C1 = 1,000,000/[(2)(3.14)(10 Hz)(220 Ohms)]

C1 = 1,000,000/13,816C1

C1 = 73 uF

Because 100 uF is the next higher standard value capacitor, most designers will select 100 uF for C1 instead of 73 uF.

A relatively recent form of IC linear amplifier is the Norton amplifier, also known as the Current Difference Amplifier (or CDA). The CDA produces an output voltage that is proportional to the difference between two input currents. The operation of the CDA is not exactly analogous to the op amp (i.e. with the input voltages replaced by input currents), so will not be detailed here.

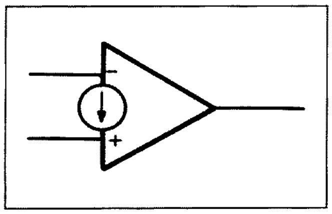

Fig. 5. Symbol for the CDA op amp.

The symbol for the CDA differs from the normal op amp symbol in order to distinguish its unique operation. The CDA symbol shown in Fig. 5 is the regular differential amplifier symbol with a current source symbol added along one edge to let the reader know that current mode is intended.

Operational Transconductance Amplifiers (OTAs)

Another form of linear IC amplifier, different from either op amp or CDA, is the operational transconductance amplifier, or OTA. This type of amplifier has a transfer function that relates output current to input voltage. Since the transfer function expression has the units Amperes/volts (or sub-units thereof), the transfer function gain can be expressed in the units of conductance, mhos (or the subunits millimhos or micromhos). Since these are units of conductance, I/V, we call the

All in all it is better to use the alternative circuits using series diodes—but Fig. 8 is provided for the truly bold reader.

amplifier a transconductance amplifier. The name operational conveys the idea that some of the functions are similar to those of the operational amplifier.

Operational and other linear IC amplifiers are sensitive to problems on the dc power supply. The amplifier may oscillate if not properly decoupled. Furthermore, variations and noise placed on the dc power supply lines in one stage can affect the other stages. Power supply rejection is not absolute.

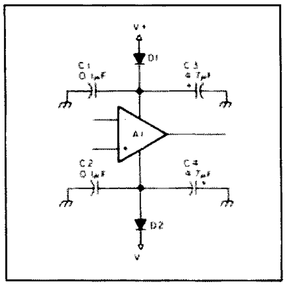

Fig. 6. Decoupling capacitors.

We also find one other problem, especially in breadboarding and in portable (battery operated) equipment: reverse polarity dc power supplies. The results will be catastophic in that case! An operational amplifier with reversed dc power supplies will be destroyed instantly. Let's see how problems can be fixed in practical circuits.

The problems with noise and oscillation are cured with decoupling capacitors on the amplifier power supply terminals. Capacitors C1 and C2 (each 0.1 uF) in Fig. 6 are used to decouple high frequencies, while the low-frequency decoupling is provided by C3 and C4 (each 4.7 uF or higher). Now why do you suppose that two forms of capacitors are needed at each op-amp power supply terminal? That seems a bit odd, doesn't it? Why not just use the 4.7-uF capacitors—they are very much higher in value than the 0.1-uF units, after all.

The higher value capacitors (C3 and C4) are typically aluminum or tantalum electrolytics. The performance of these capacitors drops drastically as frequency increases, and may well be zero at higher frequencies that are nonetheless within the range of most IC operational and other linear amplifiers. At those elevated frequencies, the typical electrolytic capacitor is about as effective as a block of wood. For this reason we also use a smaller value capacitor, but one that is of a type that will work at higher frequencies (e.g., mylar™, mica, ceramic, etc.). This situation is changing a little bit, however, as certain new forms of capacitor are now able to offer high-frequency operation as well as high capacitance.

One rule of thumb ensures the success of the circuit in regard to noise and oscillation: Place those capacitors as close as physically possible to the body of the amplifier. The 0.1-uF capacitors (C1 and C2) are more important than the higher value capacitors, so should be closest to the IC amplifier body.

The fix for reverse polarity conditions (apart from not doing it in the first place) is shown in Fig. 6 also. Diodes D1 and D2 are placed in series with each dc power supply line. Under normal operation these diodes are forward biased, so will conduct current to the amplifier. When some goof-ball (like me) accidentally connects one or both dc supplies backwards, then these diodes are reverse biased so will not conduct current. Thus, the series diodes protect the amplifier IC from someone's stupidity. Typical diodes for this application are any of the 1N400x series (1N4001-1N4007).

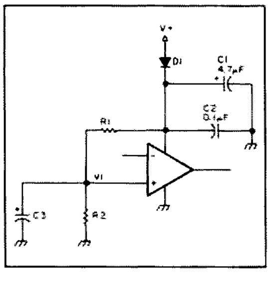

Fig. 7. Diode added to protect op amp from accidental reverse-polarization.

For single-polarity dc power supplies we need only a single diode, as shown in Fig. 7. Again, a 1N400x diode is both low cost and effective. In both cases (Figs. 6 and 7), it is imperative that the capacitors be used as well as the diodes.

A brute force method of protecting the amplifier is shown in Fig. 8. In this case, a zener diode is placed across the two dc power supply terminals of the amplifier. The zener potential must be greater than the maximum value of [(V+) - (V−)]. For a case where dc power supplies of ± 12 V dc are used, then this value is 24 volts. A 28-volt zener diode would be adequate, provided that the power supply voltages are reasonably stable. Under these conditions, with Vz greater than the voltage between the terminals, zener diode D1 is reverse-biased at a value lower than the zener potential. Thus, it is not used in normal operation.

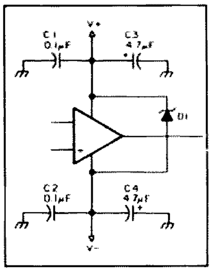

Fig. 8. For the "Bold reader."

In reverse polarity operation, diode D1 becomes forward biased in the non-zener mode. It will pass current around the amplifier harmlessly—hopefully. The big maybe is whether or not the zener diode will be destroyed. One solution is to use a very high value of power dissipation for D1. Another solution is to place a series resistor in the line with D1. All in all, it is better to use the alternative circuits using series diodes—but Fig. 8 is provided for the truly bold reader.

The protection of multiple amplifier stages is shown in Fig. 9. There are two alternatives shown in this figure. In one case, we could place 1N400x-series diodes across the power supply lines and series current-limiting resistors to prevent them from burning up. The diodes are normally reverse biased, but when one or both dc power supplies are reversed, then these diodes become forward biased—and short line to ground.

The second alternative is to place the diodes in series with the line at the power supply terminals (shown in dotted lines in Fig. 9). This method is analogous to the method of Fig. 6, except that it serves more than one amplifier.

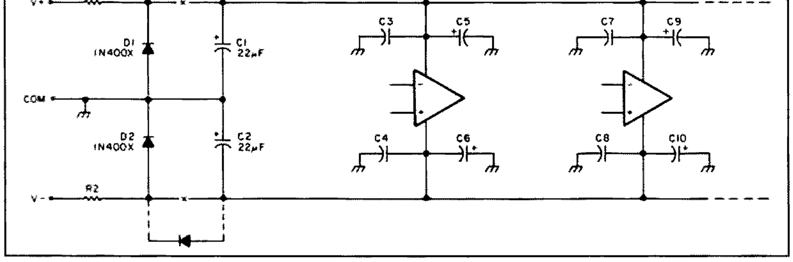

Fig. 9. Alternative uses of protective diodes. (C3, C4, C7, C8 are 0.1 uF; C5, C6, C9, C10 are 4.7 uF.)

Conclusion

We have discussed the operational amplifier, the current difference Norton amplifier, and the operational trans conductance amplifier. We have also covered amplifiers in general, and methods of protecting IC amplifiers. How to use these devices can be found in several different texts and, I am sure, on these pages from time to time. ■

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Gunn and IMPATT Microwave Devices

The author shows how to safely test these diodes used in 10-GHz operation.

Over the past 20 years, microwave equipment has been changing over to solid-state devices at a very fast pace. Solid-state devices now dominate in the low- to medium-power ranges. I had been very comfortable with vacuum tube devices so it took some adjustment for me to switch from klystrons to diodes as microwave oscillators.

Vacuum tubes are forgiving—they give some indication before going self-destruct. Unfortunately, this is not the case with transistors and diodes, where it is often too late by the time you see the flash or smell the smoke.

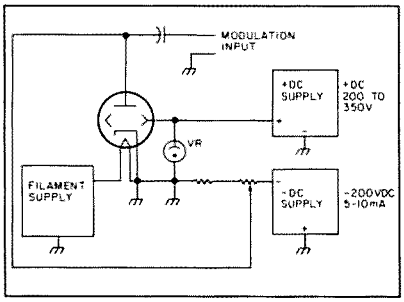


Fig. 1. Schematic for the klystron system.

This one fact I believe has kept many from experimenting with them.

I have outlined some procedures in testing surplus solid-state devices in a non-destruct environment—particularly, Gunn and IMPATT (IMPact Avalanche Transit Time) diodes for use on our 10-GHz microwave bands. The procedures described here will give an insight into how these devices operate and how to handle them.

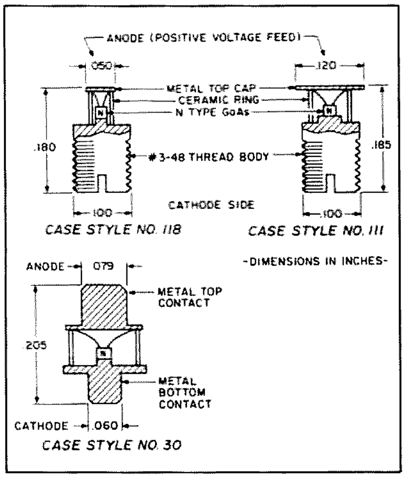


Fig. 2. Cross length section Gunn diodes in several typical packages.

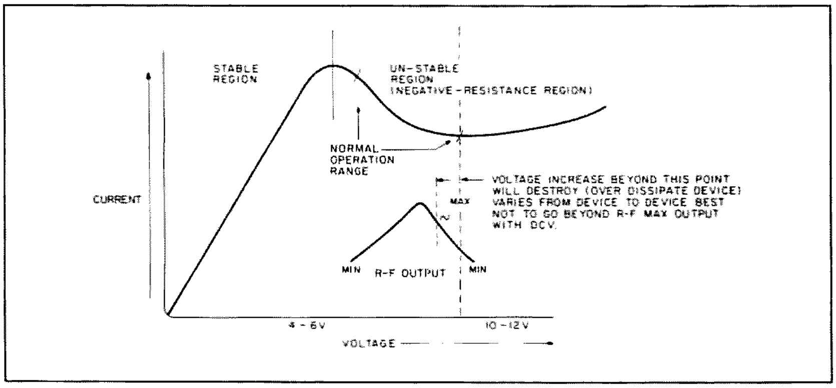


Fig. 3. Current/voltage plot for a typical Gunn diode. The diode starts to exhibit negative resistance at around six volts across it.

Klystron vs. Gunn

The klystron vacuum tube has been in use for quite a long time, and many pieces of test equipment still use the old reliable 723A/2K25-type tube. Three power supply voltages are required to operate the tube: B+ dc, B− dc, and filament. The power supply weight for this is at least 10 pounds, and not exactly portable. The power output of the average klystron was about 10 to 20 milliwatts. I have operated pieces of equipment producing 100-mW output, but they required boilers to carry away the heat produced in generating rf. The klystron system is bulky and non-portable (See Figure 1).

The obvious advantages to solid-state devices at microwave frequencies outweigh the high initial cost. A simple Gunn diode oscillator requires only a single low-voltage-dc supply. Let's examine what is required, just what constitutes a Gunn diode or IMPATT diode, and also what makes them different from each other, and how they operate to produce microwave energy.

Gunn diodes were named after J.B. Gunn of IBM, who in 1963 discovered a fluctuating current while testing a piece of Gallium Arsenide (GaAs). While it is held that he did not connect the microwave possibilities at the time, he did discover the effect first. Just prior to this, Ridley, Watkins, and Hilsum postulated the existence of negative resistance in semiconductors. They laid out the theory to a tee, but their attempts to prove it in the lab failed due to the purity of their specimen of GaAs. Another scientist, Kroemer, tied together the postulated theory and the fluctuating current observed in Gunn's experiments and declared they were one and the same: the theory and the proof of negative resistance. Gunn did not recognize the mi-

crowave oscillation because he was looking for noise in semiconductor materials, not rf.

This Gunn diode should be called a silicon or gallium arsenide resistor as in reality it does not have a P-N junction as normal diodes do. We all think of PNP and NPN transistors, and I even take for granted the diode. But all common diodes have a P-N junction—at least, detectors, rectifiers and multipliers.

Another factor making diodes suitable for microwave frequencies is their very short leads. This gives them a very low inductance and capacitance to present to the microwave circuits. Stray inductance and capacitance can make microwave circuits very hard to tame or not work at all. See Figure 2 for some typical packages used in microwave diodes. The screw terminal is the cathode in these devices. Microwave Associates lists a capacitance of .22 pF and an inductance of .16 nH for this 118 case/package at 10 GHz.

Microwave Gunn diodes as well as other types are quite small. The threaded side of the diode is used for connection in the heat sink for dissipation, and is given a good contact with the surface with a small dab of heat sink compound. The efficiency of these diodes is low, less than about 20%, but considering the ease with which they can be made to operate, one can overlook that. The wafer-thin piece of Gallium Arsenide is attached to one end of the heat sink post (see Figure 2) and covered by a .050-inch ceramic sleeve. The top of the GaAs is attached with ribbon contacts and put on top of the sleeve for fixing to the top cover plate for the contact to the dc supply feed. This post is the anode in the diodes that I have. It can be reversed, but that is by special order from the original supplier of the diodes.

Gunn Operation

This wafer-thin GaAs Gunn diode is mounted in a suitable microwave cavity or waveguide and coupled to a source of dc voltage, positive to the anode. When the voltage is adjusted to some critical value, microwave oscillation will take place and is controlled by the dimensions of the waveguide and post connecting the diode. The resistance of the diode varies but is in the range of 1 to 10 Ohms in samples I have tried. Gunn diodes are driven with a constant voltage supply. This allows them to have all the current they want as long as the voltage is held to some special value, usually under 12 volts.

Testing different Gunn devices, I slowly raise the voltage from a supply made from a LM-317 adjustable regulator mounted near the device. As the voltage is increased, the current is increasing in proportion to the voltage until a critical point, when a slight increase in voltage produces a slight decrease in current. At this magic point (somewhat different for various devices) this is the negative resistance region where microwave oscillation is starting to take place.

This voltage is in the area of 4 to 6 volts for most diodes; it varies quite a bit. The upper voltage limit is not very high, and the maximum voltage on the highest device that I have is about 18 volts. I might suggest preventing

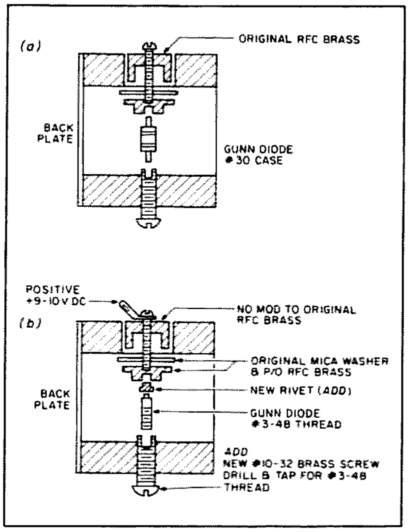


Fig. 4. SOLFAN Cavity Modifications.

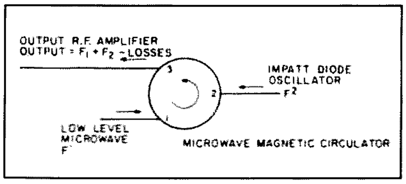


Fig. 6. Amplification using an IMPATT diode oscillator.

destruction by not going above 9 to 10 volts until you are sure of what you have. Keep the voltage low, and the diode will be fine. Keep going only if you really need to know where breakdown is located. I have destroyed many devices in pursuit of this knowledge. Onerule I have discovered is that if the diode starts oscillation on a low voltage, say 4 volts, its maximum voltage will be around 10 to 12 volts; or those starting around 5.5 volts, the max is 14 volts. Most Gunn diodes available on the surplus market today have a top voltage of 12–14 volts dc.

This point of negative resistance is just inside the unstable region of the diode's curve. What is happening is that the current inside the Gunn diode GaAs wafer is being bunched up and arrives on the other side of the material in a pulse of current. The period of this pulse is the microwave frequency of operation and can also be adjusted by varying the voltage within this unstable area (see Figure 3).

As the voltage is increased past this starting point of oscillation, current still increases but not in such a direct manner as before oscillation. The output power of the Gunn device is increasing until some further point when a further increase will produce a decrease in rf power output. If the voltage is increased further, a point will be shortly reached which will be very near the destruct voltage of the device. Note that 1/2 to 1 volt beyond maximum rf, output will put you near that region.

My diodes put out power in the 100–250 mW range and operate with 8.5 to 10.5 volts,

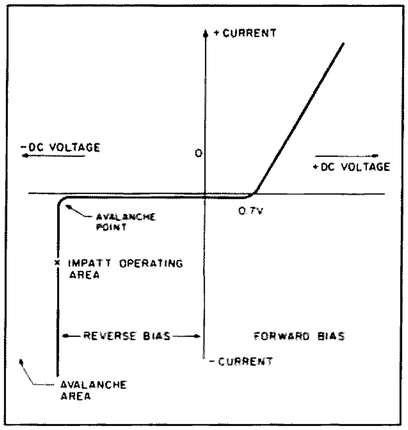


Fig. 5. Typical current/voltage curve for an IMPATT diode.

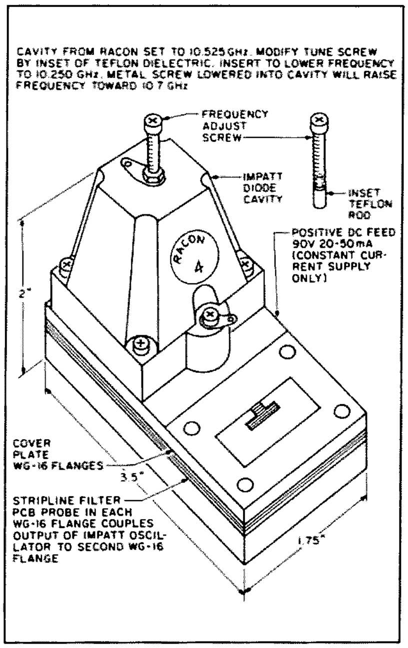


Fig. 7. RACON IMPATT source and filter.

drawing about 600 to 850 mA of current. A good heat sink or large metal cavity is required for long-term operation and device stability. I have violated this point on occasion and lost several expensive diodes.

The cavity I have experimented with is the SOLFAN mount, a cast metal cavity with the diode mounted in the center of a large block of metal. This cavity was intended to be run at 10 mW, with a 200-mW diode (+23-dBm output). It gets quite hot after about a half hour of operation. You can hold it in your hand for a short time before it is uncomfortable. A better heat sink is needed for longer operating periods. A cavity temperature of 100–120 degrees Fahrenheit is normal, and for stability, maintaining a constant temperature will slow frequency drift and eliminate the variables resulting from temperature changes.

This cavity has to be modified slightly with

the addition of a solid rivet placed in the rfc-dc-feed inside the cavity. I placed the rivet in the hole and tapped it lightly with a punch to seat it. It will not fall out of the cavity's rfc, but can be removed if you wish to replace the original 10-mW diode. To remove the rivet, pinch with small diagonal pliers and the rivet will pop free. A new 10/23 brass screw is drilled out and taped to accept the 3/48 threads of the high power Gunn diodes. (See Figure 4)

Although I have not tried this, I have heard about placing two Gunn diodes in parallel to achieve a higher power output than can be obtained from one device. They may be mounted in a waveguide and spaced 1/2-guide wavelength apart. Remind yourself that an oscillator injected into another will cause them to lock to a common frequency as long as the mechanical tuning is within the same frequency; the other will follow for a few MHz or so.

IMPATT Diodes

The case styles used in Gunn diodes and IMPATT diodes are so small that the manufacturers do not put part numbers on the devices—you have to be very careful looking at each device on the surplus market. An IMPATT diode is operated in the constant current mode. That is, the voltage is increased to some specific point where avalanche current breakdown takes place. Some means has to be found to limit the current to a prescribed value. One very sure way to destroy an IMPATT device is to test it as a Gunn diode. The IMPATT diode doesn't tolerate excessive current. See Figure 5 for IMPATT diode curves.

The IMPATT diode is a real P-N junction, and this device is operated reverse-biased with a high voltage breakdown to produce a supply of electrons and holes. The diode is quite similar to a zener diode but is doped with impurities to have a controlling effect on the avalanche current so necessary for its operation. In this unstable mode, the voltage is made variable in the 80-90-V range, and the current is limited to about 30-50 mA. This can be set with a fixed resistor. The IMPATT diode has a critical voltage where microwave oscillation will take place somewhat like the Gunn description. The IMPATTs that I have oscillate at about 82.5 volts dc with 50 mA and an output of 100 mW at 10 GHz.

The IMPATT diode is termed an Avalanche Effect device. What is going on is the holes and electrons are involved in Impact and Ionization within the P-N junction and produces a negative resistance at some critical voltage with controlled current supplies. IMPATT operation happens when the voltage of the ringing waveform through the diode adds with the dc bias and causes the junction to go into the avalanche mode.

If the device is biased properly, the junction will produce output on half of the duty cycle. In this case, the IMPATT diode is biased just above the point of avalanche, and when rf swings positive the avalanche current (which builds up slowly) reaches its peak when the rf voltage is zero. This repeated operation produces a current pulse traveling toward the anode. This type of operation is very noisy and is not suitable for local oscillator use in a receiver. It does produce quite an output, and the high voltage required for operation makes them somewhat less desirable than the Gunn diodes for portable operation.

IMPATT Amplifiers

IMPATT diodes are used in amplifiers, and the commercial applications are numerous. The IMPATTs are operated (CLASS C) but from where I sit, their construction appears to be little less than black magic. What they do is run the IMPATT diode and couple low-level rf into a circulator which couples the energy to the port that the IMPATT is at. The low level rf and the output of the IMPATT (adjusted very near the input frequency) become locked to the input source and combine, producing a reproduction of the input signal at a higher power level (Figure 6).

We have been toying with the idea of using a RACON IMPATT source and filter in a 10-GHz beacon so that many stations could use it at their convenience to tune and test systems. By having the IMPATT source at someone's home, the problem of high voltage power is minimized. I was very fortunate to be able to pick up several of these RACON sources new, and plan to use one for our San Diego Microwave Group's beacon. See Figure 7 for details on the IMPATT cavity and filter used. This low-cost source is available from RACON. This device is made to operate at 10.525 GHz (pn 10000-104-02) with a wide band filter 8.2 to 12.4 GHz (pn 10000-109-01). The last price list I have from RACON lists the IMPATT source and filter at $60. (RACON, 8490 Perimeter Rd., S. Seattle WA 98108.)

Projects in the future include a simple home-made transmitter receiver out of items easy to obtain (the hardest of these to find is 1″-round Teflon® stock.) It has become very easy to generate rf at appreciable power, but it was somewhat difficult to achieve good receiver sensitivity—at least prior to current design.

Other projects in the very near future are some test equipment and i-f preamplifiers using low-cost devices. All projects have been the direct result of many hours of experimenting and field trials with each one making our equipment easier to use or improved in operation.

I can make available high-power Gunn diodes, case style 118 with silver brass rivets, operating at 10 GHz with measured power output better than 50 mW to aproximately 100 mW, for $5 each, postpaid in the continental U.S. Some select higher power devices are available for 6, 10, and 18 GHz. Power output varies from one cavity design to another. I would be happy to answer any questions regarding this or other related projects, but please enclose an SASE for prompt reply. ■

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. To make our job easier and to ensure your listing is correct, please type or print your request clearly on a full (8-1/2 x 11) sheet of paper. Double-space and use upper- and lowercase letters where appropriate. Also, write numbers carefully—a 1, for example, can be read as an l or an i or a 7 as a 1. Thanks for your cooperation.

I am looking for a receiver for the 225-400 MHz AM Military aeronautical band. I know that there are several continuous coverage scanners available, but they are $350 up—do you have something cheaper?

Doug Graham
4929 Elm
Arcadia TX 77517

I need service info for the following items and will purchase or pay for the copying costs: Unicom Electronics power supply Model PS-11R, Tandy 64K Color Computer II, Model 26-3127, EMP/GTS Manual Mini Modem Model MM-101 (manufactured by Elec and Eltec Co., Hong Kong), Heathkit Oscilloscope Calibrator Model IG-4505, Leader rf signal generator Model LSG-11, Garrard Turntable Model Lab 95B, Johnson Messenger CB Model 323, Apple IIe Pro System Duo-Disk Imagewriter PrinterMonitor II, and ICOM IC-735 Transceiver.

Mike Adams—Haney Vo-Tech Center
3016 Hwy 77
Panama City FL 32405

I am looking for the following items (please state price and/or condition in correspondence): Two transistors MRF 455 A; an MFJ-962, -949C, -941D, or 989 antenna tuner: five 7868 tubes; ten #12 6-V lamps for Bogen PA Amps; one bandswitch each for the Panasonic rf 2800 receiver #RSR 98W or equivalent; one printer and disk drive for the Tandy Color Computer II Model 26-3127: and one Z-80/CPM and Modem Board for the Apple IIe Pro System.

Mike Adams—Haney Vo-Tech Center
3016 Hwy 77
Panama City FL 32405

Wanted: External Frequency Display YC-7B for the Yaesu FT7B.

Bill Parker W4YKW
3154 Ravenwood Dr.
Falls Church VA 22044

Robert Dennison KB4MDR, G8GNC
625 Shadywood Lane
Raleigh NC 27603

Satellite TV Receiver Components

These make versatile building blocks for 23cm projects.

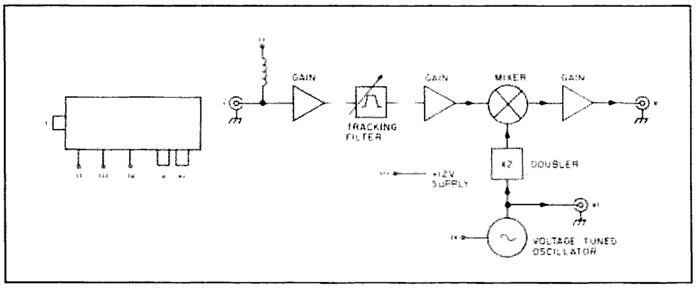


Fig. 1. i. 950 to 1450 MHz input (F connector). ii. To place a dc voltage on the center conduction at i. Normally used for powering an LBN (low noise block converter). Could be used for powering a preamp in amateur applications. iii. 12-V dc supply (should be regulated). iv. Tuning voltage. Tunes the oscillator and front end tracking filter. The oscillator operates on the high side at half the required frequency, i.e., (f in + 70)/2 MHz. The tuning voltage is typically 3 V at 950 MHz, 18 V at 1450 MHz, and 12 V at our 1250 MHz. The curve is quite close to being linear. v. The 70-MHz i-f output (RCA connector). Overall bandwidth of front end tracking filter and 70-MHz output is at least 25 MHz. vi. Oscillator output for phase-locking applications (RCA connector) level is approximately −20 dBm.

Modern block conversion satellite receivers in the 3.7- to 4.2-GHz band most commonly have a first i-f of 950 to 1450 MHz. Our 23-cm band of 1240 to 1300 MHz is conveniently located within that band. Not surprisingly, the mass production of these receivers has brought some very useful components within reach of the radio amateur. The use of these components as building blocks for 23-cm projects takes away most of the technical difficulty of designing and constructing at this frequency. Some of the most useful components are:

1. The Satellite Receiver Front End—A typical example is the Mitsumi (Japan) TIF A52F tuner shown in Fig. 1. This unit converts 950- to 1450-MHz signals to 70 MHz.

2. Electronic PIN Diode Switches—In their satellite receiver application, these are used for selecting between two 950- to 1450-MHz signals, one for receiving horizontally-polarized transmissions, one for receiving vertically-polarized transmissions. Chokes and rf decoupling are often provided between input and output to facilitate dc powering. Frequency coverage of the switch is typically 400 to 1500 MHz, so applications on the 70-cm and 23-cm bands are possible. See Fig. 2.

3. Final I-f Filters: 70 MHz is the most

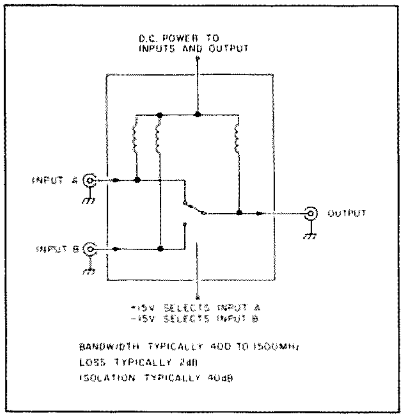


Fig. 2.

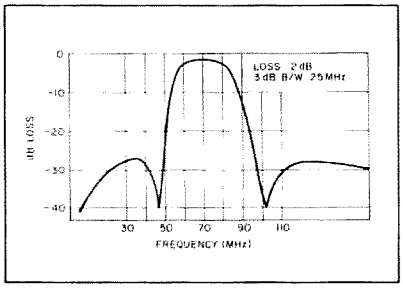


Fig. 3.

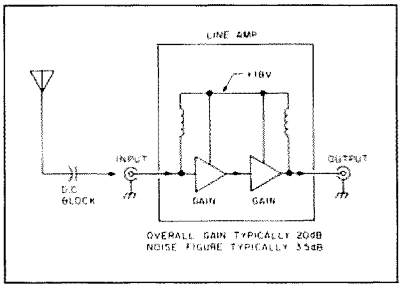


Fig. 4.

common final i-f in satellite receivers. The bandwidth is normally around 25 MHz. A typical response curve is shown in Fig. 3. This could serve as a roofing filter in an intermediate i-f in multiple conversion systems. Note that the bandwidth covers approximately 58 to 82 MHz, so TV channel 3 (60 to 66 MHz), channel 4 (66 to 72 MHz), and channel 5 (76 to 82 MHz) will be passed. This gives many possibilities for amateur television use.

4. 950- to 1450-MHz Line Amplifiers—These are designed to overcome the cable attenuation when long runs of cable are used. Typical gain is 20 dB with a noise figure of 3.5 dB. For use as a preamp, that noise figure is only fair, but it makes a good starting point. These units are powered from +18 V on the center of the coax, so if you are using an antenna which is a dc short, you need a blocking capacitor on the input of the preamp. Female "F" connectors are used on the input and output. Note, it may be necessary to put a 23-cm band filter ahead of this amplifier to prevent intermodulation, particularly from local UHF TV stations.

Using the Components

The remainder of this article describes some of the possibilities of using these components for 23-cm projects in areas such as amateur TV (AM or FM), 23-cm receivers, and 23-cm repeaters (linear, FM or TV). Note that for high sensitivity receiver applications, a preamp will be necessary as the above-mentioned front end has a noise figure of typically 14 dB, but a preamp with 20-dB gain and 3.5-dB noise figure will give a system noise figure of approximately 3.9 dB.

1. High Stability Receiver For All Modes 1280 to 1300 MHz (Fig. 5). 1280 to 1300 MHz is the primary area of the 23-cm band for weak signal work. The preamp defines system noise figure. At first i-f, 1300 MHz will become 60 MHz, 1290 MHz becomes 70 MHz and 1280 MHz becomes 80 MHz. All pass through the 70-MHz filter. The LO in the front end is: (1290 + 70)/2 = 680 MHz.

To phase-lock it to that frequency in the block diagram shown, X_1 should be 680/64 = 10.625 MHz.

The 70-MHz signal is then converted to 20 MHz; 60 MHz to 30 MHz, and 80 MHz to 10 MHz. This requires X_2 be 70 + 20 = 90 MHz. Note that the two high-side oscillators give us two inversions (= no inversion). The 1280- to 1300-MHz band can now be tuned in at 10 to 30 MHz with sidebands the original way around, on a general coverage receiver.

2. Amateur Television (AM) Receiver—The receiver of Fig. 6 simply downconverts the 23-cm signal to a 70-MHz signal, where it can be received on a TV set tuned to channel 4. If channel 4 is occupied in your area, channel 3 or 5 will also work due to the bandwidth of the unit. The front end is not phase-locked as there is no need to worry about frequency stability because: (a) The front end is inherently quite stable, (b) Television is a wideband mode, and (c) The television set's afc will operate at channel 4. The major disadvantage of the system in Fig. 6 is

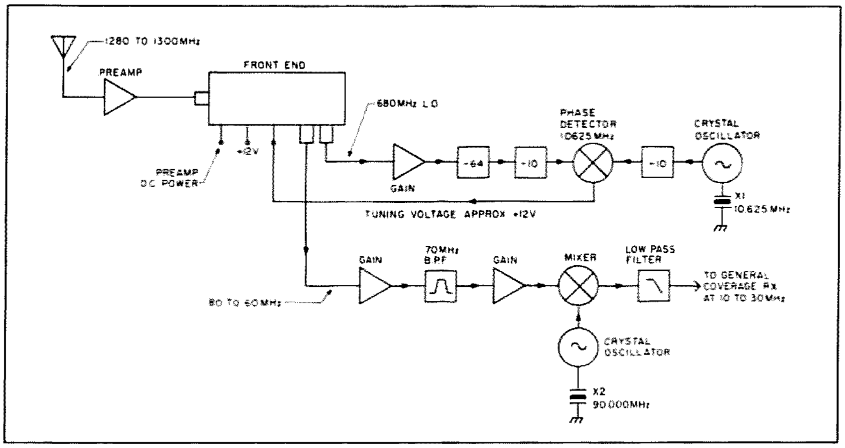


Fig. 5.

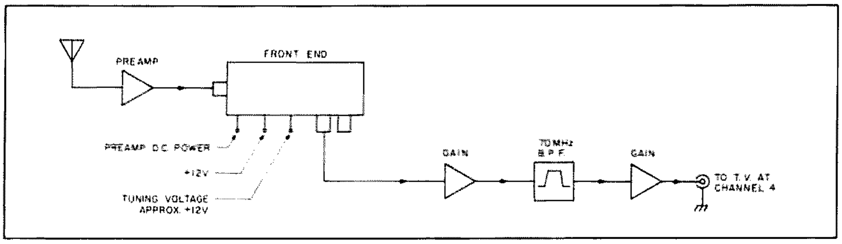


Fig. 6.

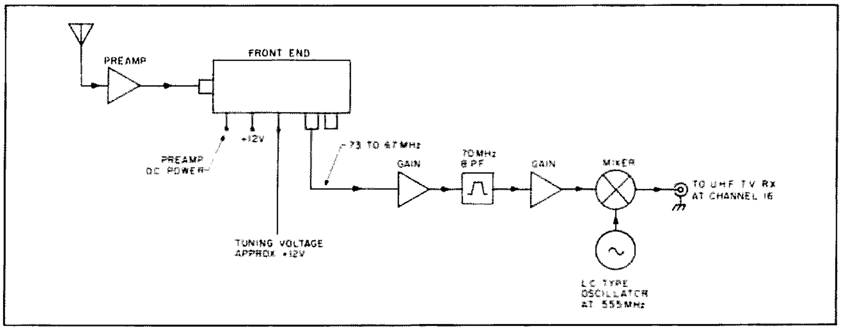


Fig. 7. Example shows 1247-MHz-to-1253 MHz TV channel.

spectrum inversion due to the high side LO, though this is not a problem if the transmission is double sideband. Fig. 7 shows a receiving system which eliminates the problem by using a second conversion, again with a high side LO to return the sidebands back the right way around. The example shows converting a 1247- to 1253-MHz signal to UHF channel 16 (482 to 488 MHz), though a high VHF channel could also have been used. Again, no need to worry about oscillator stability or exact frequency as the television receiver's afc will take care of it.

3. Variable Antenna Pattern for 70 and 23 Receivers (Fig. 8). A typical application could be switching between an omni-directional antenna and a yagi in a repeater receiver. The PIN diode switch described at the beginning of this article will select one of the two inputs, according to whether +15 V or −15 V is applied to it. Note that each antenna has a preamp ahead of the switch so that the

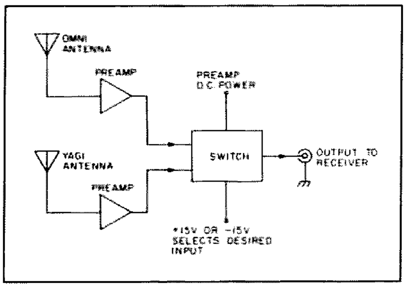


Fig. 8.

switch's 2-dB loss does not hurt the system noise figure.

4. 23-cm Repeater Receiver (Fig. 9). This design can apply to FM repeaters or linear transponders. The block diagram is identical to the high stability receiver with the center of the desired channel being converted to 10.7 MHz. At the 10.7- MHz output, a filter of

appropriate bandwidth is included. In FM repeaters, this will be a 16-kHz filter. The signal will then be amplified, limited, and detected in the usual manner. In a linear transponder, an appropriate bandwidth filter will be followed by conversion to the desired output frequency.

5. FM Video Receivers (Fig. 10). FM video, like that used on satellite TV signals, is superior to AM video for weak signal work due to the FM improvement factor. The big disadvantage is the wide bandwidth occupied. By placing the 950-to-1450-MHz tuner ahead of a 70-MHz satellite TV receiver, we have a receiver for FM video in the 23-cm band. Note that in a block conversion satellite receiver with 950- to 1450-MHz i-f transponders, 8, 9, and 10 fall at 1290, 1270 and 1250 MHz, respectively, opening the way for ready-made receivers, especially if we place our audio on a 6.8-MHz subcarrier!

6. Place the receiver in the shack and use cheap coax! It is most convenient to have our equipment indoors (temperature, weather, etc.) but the best coax cable is very expensive and its loss would add directly to the system noise figure. RG-6 cable is cheap, readily available and has loss of about 8 dB per 100 feet at 1300 MHz. If a 20-dB gain, 3.5-dB noise figure preamp is mounted directly behind the antenna, and 50 feet of RG-6 cable run to the satellite receiver front end (noise figure 14 dB) in the shack, then the system noise figure will be approximately 4.5 dB (see Fig. 11). Note that the front end provides a pin for placing a voltage on the coax center conductor, which can be used for powering the preamp.

Happy experimenting on 23 cm. ■

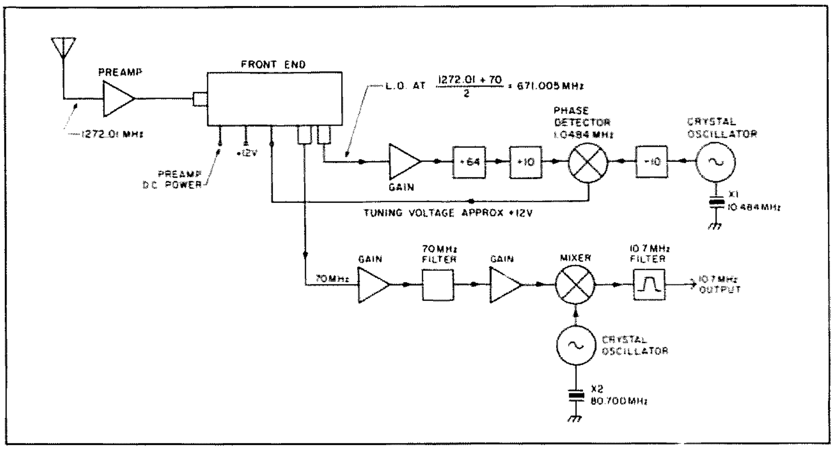


Fig. 9. Example shows 1272.01-MHz FM repeater input.

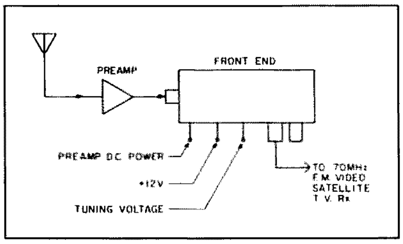


Fig. 10.

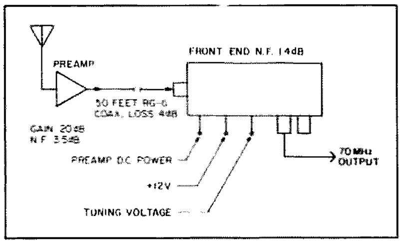
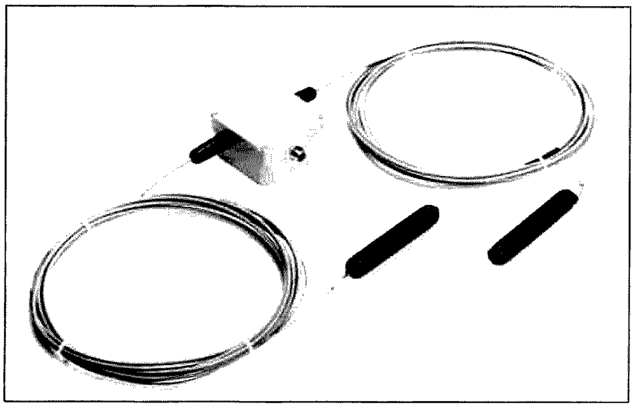


Fig. 11.

NEW PRODUCTS



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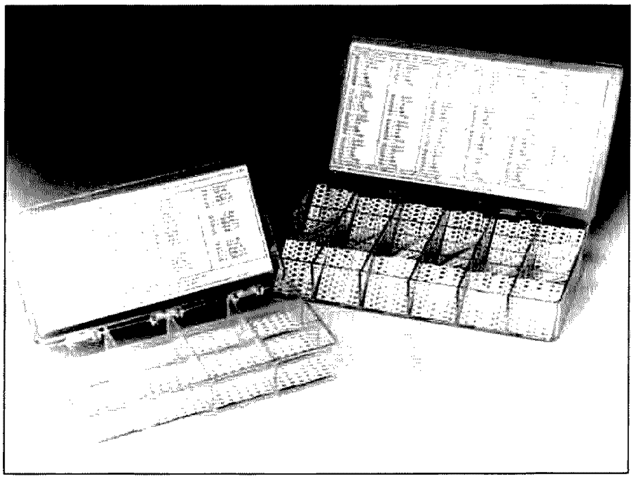
For more information, contact *Communications Specialists, Inc., 426 West Taft Avenue, Orange CA 92665 (800/854-0547)* or circle Reader Service Card number 209.



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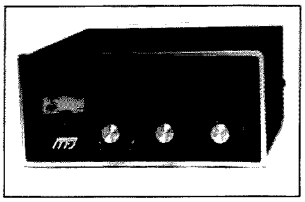
MJF-931 ARTIFICIAL GROUND

MJF Enterprises announces the release of its MFJ-931. It creates artificial rf ground with random wire and electrically places far away ground directly at your rig.

The MFJ-931 connects between the ground connection of your transmitter or antenna tuner and the antenna. Two controls on the MFJ-931 are adjusted for maximum rf ground current using its built-in rf ammeter. This resonants the random wire, converts it into a tuned counterpoise and presents an effective low impedance near ground potential to your rig. Thus an artificial rf ground is created.



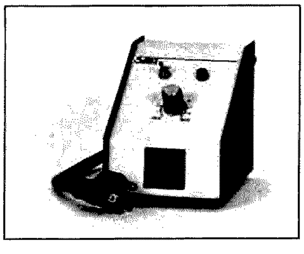
MJF-931 Artificial Ground

The MFJ-931 covers 1.8 to 30 MHz and is ruggedly built in an all aluminum cabinet with a brushed aluminum front panel. The retail price for the MFJ-931 is $80. It comes with a one year unconditional guarantee.

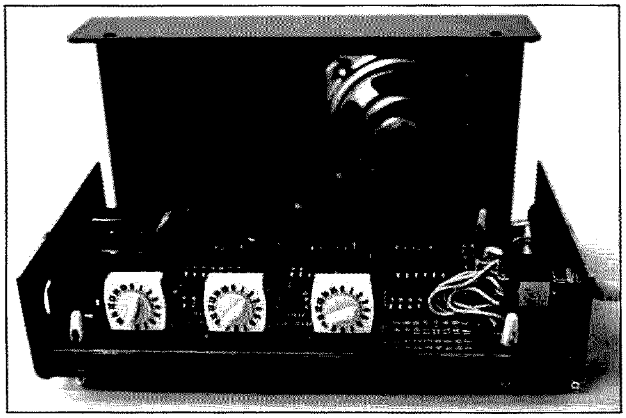
For additional information contact *MFJ Enterprises, Inc., at PO Box 494, Mississippi State MS 39762 (800/647-1800 or 601/323-5869)* or circle Reader Service Card number 207.

MODEL S-4 CONTROL UNIT

For your soldering projects, Sibex announces the release of the Model S-4 control unit. This product is designed to convert any soldering iron into an adjustable



Model S-4 Control Unit



Auto-Kall AK-10

temperature soldering station. The unit works with any 110 v AC powered iron up to 100 Watts in size.

Solid state circuitry is utilized to produce a spike free, adjustable dc voltage and minimizes the possibility of damaging critical components.

The Model S-4 offers a low-cost alternative for a temperature adjustable soldering station. The cost of soldering iron and tip replacement is minimized since the operator is not locked into a particular brand of iron for replacement.

Units are available from stock priced at $49.

For more information, contact *Sibex Inc., 1088 Kapp Drive, Clearwater FL 33575 (813/441-8525)* or circle Reader Service Card number 210.

MODEL 70-253

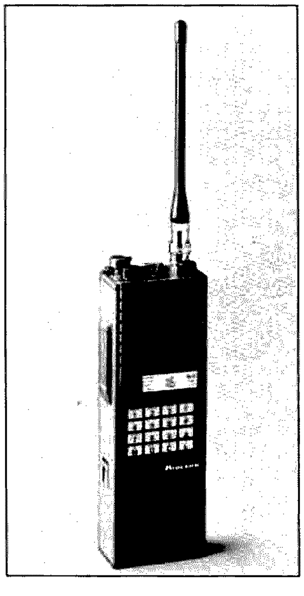
A new 16-channel programmable frequency-synthesized UHF portable two-way radio has been introduced by Midland Land Mobile Radio. The Model 70-253 portable features a front-panel keypad, liquid crystal display and a rated RF power output of 5 Watts, keypad switchable to 1 Watt. The new portables are currently FCC accepted for the frequency range 450-470 MHz.

Tone-coded squelch (CTCSS) is standard and each channel is separately programmable for any EIA tone. A DTMF option is also available. The programmable channel scanning option provides three scan modes: carrier, CTCSS or open-channel. The new portables use an E2PROM-controlled microprocessor which permits any of the programmable functions to be quickly reprogrammed by an authorized technician equipped with a special programming unit.

Accessories include an external speaker/microphone. Three interchangeable battery options are available: 600 mAh and 1000 mAh rechargeable nickel-cadmium battery packs and a case for expendable batteries. With the 1000 mAh battery pack the Midland 16-channel UHF portable will provide 8 hours of operation at 5 Watts with a 5-5-90 duty cycle.

Equipped with the 1000 mAh battery pack, the new 16-channel portables are approximately 23.6 oz (0.67 kg). With the 600 mAh battery pack, the approximate height is 7.1" (183 mm) and weight is 21.1 oz (0.60 kg).

For more information, contact *Midland LMR, Marketing Department, 1690 N. Topping , Kansas City MO 64120 (800/643-5263)* or circle number 212 on your Reader Sevice Card.



Midland LMR 70-253 UHF portable

NEWS FROM MOTRON AUTO KALL AK-10

The Auto-Kall model **AK**-10 is a complete 3-digit DTMF touchtone™ selective calling system. Auto-Kall serves those who want to remain available and do not want to constantly monitor a busy repeater or simplex frequency. With the Auto-Kall you can get through to home when you are mobile or vice-versa. Set it to decode 911 and monitor the emergency phone calls on an autopatch repeater. DXers can let each other know when that rare one on their DX wanted list shows up.

The AK-10 can be used on any FM or AM receiver, transceiver, or scanner, and connects to the external speaker or earphone jack of your rig. Easy to operate, the personal code is set or changed in seconds with three small 16-position rotary switches.

The AK-10 includes a full 90-day warranty and the $90 price includes the AC power supply and audio patch-cord.

For more information, please circle Reader Service number 202.

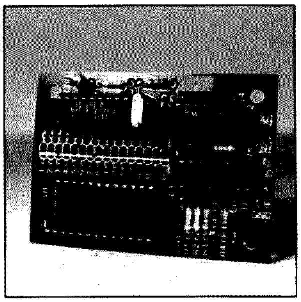
AUTO-CALL AK-4

The DTMF selective calling/control unit is suited for personal calls, group calls, control outputs and has unique control-up/control-down codes with adjustable time relay output.

Adjustable timed relay activates when code is received. When personal call code is received the relay can be used to turn on a speaker in order to hear an incoming call. Up to 16 different group call codes can be programmed into the AK-4. The onboard timed relay works with both the personal and group calling features. Group call LED latches on to alert you that a group call was received. Open collector transistor latched output is also provided to enable a remote buzzer, light, or horn.

As a remote controller, the AK-4 can be programmed to be enabled and disabled with different first digits in the code. That way you are always sure if you are turning it on or off. The AK-4 has two independently setable, resetable latched outputs plus two open collector momentary outputs that are active as long as the programmed key is held down.

The AK-4 is available as a Printed Circuit Board kit or as a wired and tested circuit board. All calling and command codes are user programmable with jumpers and diodes. The AK-4 will work with any FM or AM transceiver, scanner, or receiver, including CB AM. It will not work with SSB. For SSB/CW the Motron HF-**ALERT** will soon be available.



Net Kall NK-1

The price for a wired and tested PCB (user programmed) is $90. For the individual PCB kits the price is $70 ($58 in quantities of 10 or more) and for the AK-4H hardware kit, $30. The AK-4H hardware kit includes enclosure, speaker, spacers, switches, jacks and LED holders.

For more information contact *MoTron Electronics, 695 W. 21st Ave., Eugene OR 97405 (503/687-2118)* or circle Reader Service Card number 203.

NET-KALL NK-1

The Net-Kall NK-1 is a DTMF decoder. Each NK-1 can respond to any or all 16 group call codes so you can program one code to bring up all units in your system.

The NK-1 uses a single digit, user adjustable, with a trim-pot. When the NK-1 is triggered, the output goes active for the same length of time used to trigger it. The output will be retriggered if the key remains down. By removing a jumper, the output will latch on and stay on until manually reset.

The NK-1 PCB kit consists of a circuit board (double sided, plated through, solder masked, silkscreened parts locations), all IC's including the SSI-202 DTMF decoder, IC sockets, resistors, capacitors, diodes, transistors and crystal.

The price for the NK-1W wired/tested PCB is $50. The NK-1K PCB kit is $40 and the NK-1B Bare Board with installation schematic is $20.

For more information, please contact *Motron Electronics, 695 W. 21st Ave., Eugene OR 97405 (503/687-2118)* or circle Reader Service Card number 204.

Hugh Wells W6WTU
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Manhattan Beach CA 90266

800–900 MHz The Easy Way

Put a UHF TV tuner in line between a scanner and a suitable antenna, and voila! You are now scanning this very active public-service spectrum.

Have you had an itch to listen in on 800-900 MHz activity? It's really very easy if you have an available UHF TV tuner and a synthesized scanner receiver. The scanner provides the i-f, detector, and search receiver. As far as the scanner knows, it is listening to 45 MHz, but in reality, it is listening to 800 MHz through a converter. TV tuners have been engineered well and provide fair sensitivity at 800 MHz. A low-noise GaAsFET rf stage ahead of the tuner enhances its operation. In large cities, however, the barefoot TV tuner gives very good results.

Attach an antenna and power supply to the tuner. Then connect the i-f output from the tuner to the coaxial antenna input of the scanner (Figure 1) and set up a frequency search from 44-46 MHz. The 800-MHz monitor is now ready to go.

Momentarily stop the search at about 45 MHz, and then slowly adjust the tuner from channel 79 through 83. Stop adjusting anytime a signal is detected, even if you went past the detected signal slightly. Do *not* reverse the tuning knob at that point, as tuner shaft backlash may cause the tuner to make a large jump in frequency passing over the previously detected signal.

Release the search and the receiver will now tune across a 2-MHz segment of the band. It will lock on any signal that is strong enough to open the squelch. If a given scanner has an oscillator birdie within the 2-MHz segment, shift the 2-MHz segment to one side or the other to avoid the birdie. TV tuners are fairly broad-banded and will usually respond over the i-f frequency range from 42–48 MHz. Some sensitivity loss may be experienced in the outer frequency limits, but this will probably not be noticed since the scanner gain makes up for this. Repeat the tuning and scanning procedure until a desired segment of the band is located.

Setting Up the Tuner

UHF TV tuners use a vfo oscillator which is sensitive to supply voltage changes. Small voltage changes will cause the oscillator to drift or wobble in frequency. If used outside the TV set, a voltage-regulated power supply must be used for power to maintain tuner oscillator stability. The circuit in Figure 2 provides up to 60 mA for 2–18 volts, which is suitable for powering most solid-state tuners.

Determine the power supply voltage before connecting power. With the pot adjusted for the lowest output, turn on the supply and raise the voltage to the desired value. *Do not exceed the rated voltage for the tuner.*. You can also determine the tuner voltage by adjusting the power supply voltage while monitoring the relative signal strength from the station for background quieting (squelch open), but this is risky. Some tuning adjustment may be necessary as the supply voltage is raised.

The voltage to the tuner shouldn't be any higher than necessary for reliable tuner operation. For most tuners, this will be below 20 volts for a full-quieting signal. The idea is to keep the transistor heat dissipation low to minimize thermal drift. Some varactor tuners need only nine volts for operation. Tube-type tuners also work well in the 800–900 MHz range.

Examine the tuner output circuit before connecting it to the scanner. Some tuners require a dc load to ground; others, like the tube-types, need B+ for the mixer plate. A 1-k resistor from the tuner output to ground will suffice for the solid-state type using a diode mixer. Direct coupling to the coax input of the scanner is normal as long as no dc supply is required for the tuner through the i-f connector.

Determining the specific frequency being monitored is very difficult using the technique described above. Calibration can be achieved only by listening to a signal of known frequency. Most UHF TV tuners use high-side oscillator injection. Injecting high or low has no effect on the quality of the received signal. When there is high-side injection, however, with the scanner searching up in frequency, the 800-MHz band will be searched downward.

Power Supply

The power supply shown in Figure 2 is assembled around the popular 723 voltage regulator IC, available at most electronic outlets. Although the IC is capable of handling up to 150 mA, a 2N2222 (2N4401 or equivalent) pass transistor is used to increase the

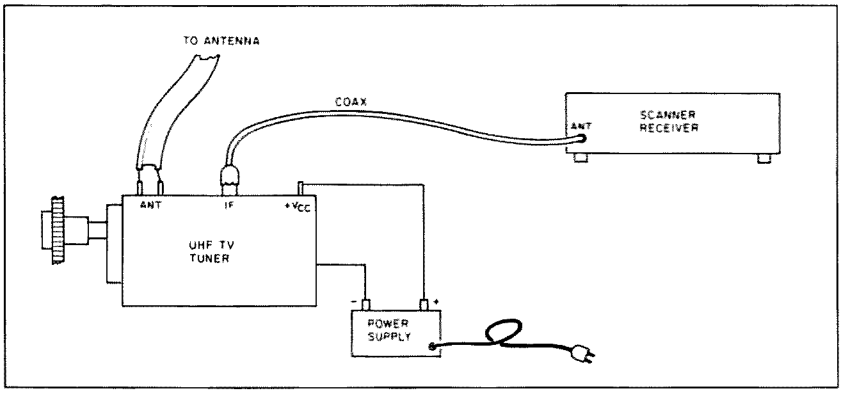

Fig. 1. The 800–900 MHz scanner.

loop gain for better regulation. Singletransistor UHF TV tuners typically draw 20 mA at about 18 V, which is well under the capacity of the pass transistor. Avoid using larger higher-current pass transistors to keep the ripple pass-through to a minimum. Larger transistors also require higher load currents. The power supply is protected from accidental output shorts by a series-current sensing resistor (R3) which limits the current to a maximum value. The resistor value for current limiting is calculated by dividing 0.66 V by the maximum desired output-limiting current. 50-60 mA is a suitable current limiting value for most tuner applications.

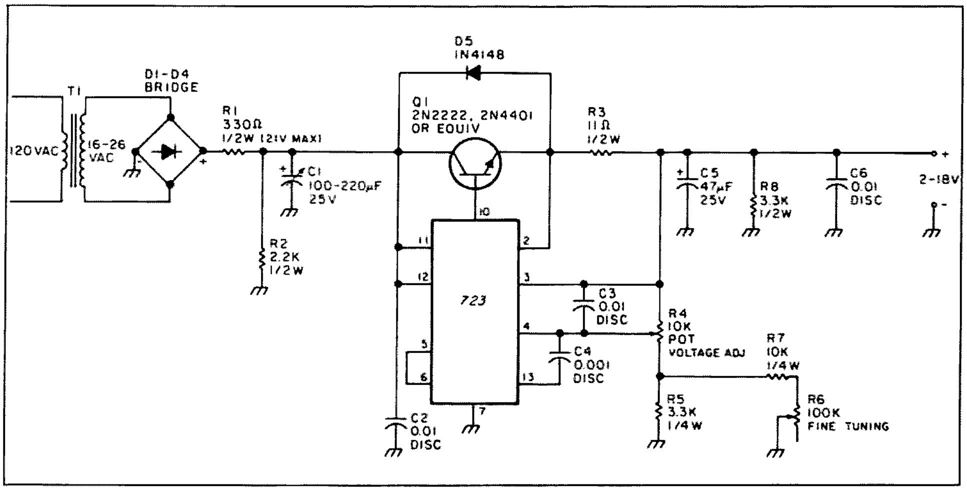

Fig. 2. Tuner power supply.

Potentiometer R6 may be added as a fine-tune. Small supply voltage variance causes a frequency shift of about 25 kHz. Some TV tuners respond more than others to the voltage change; fine-tuning capability must be determined experimentally on each tuner. Set the pot to 3/4 of maximum resistance, and vary for frequency control.

Examine the tuner output circuit before connecting it to the scanner.

Selection of a power transformer is probably the most difficult task of all. Any transformer capable of delivering 16-18 V at 100 mA will work well. A 6.3-V transformer at 300 mA followed by a voltage tripler (Figure 3) provides about 21 Vdc to the regulator. Assuming 3 V of regulator headroom, the maximum regulated output would be about 18 V, providing an ample voltage range.

Higher regulator input voltages should be carefully considered for circuit reliability. As a rule of thumb, the voltage input to the regulator should not be more than 7 V above the regulated output to keep the pass transistor heat dissipation to a satisfactory level. Resistors R1 and R2 are used to reduce the rectified output voltage to ensure a 21-V input voltage to the regulator.

Antennas

A wide variety of antennas is available for the 800-MHz band. Selecting one over another is a matter of choice determined by the signal strength from the monitored station. Even a typical UHF TV loop antenna works well for local stations, but an outside UHF TV antenna works much better since most UHF TV tuners lack an rf stage. Some readily available TV baluns (matching transformer) will work up to a gigahertz, allowing coax to be used as a feedline. Coax lengths should be kept short at 800 MHz, however, as the loss due to attenuation is quite severe.

A suitable antenna for 800 MHz which has been used successfully with TV tuners is a ground-plane antenna assembled on the top of a balun, as shown in Figure 3. The elements are cut to 3-3/8 inches long and allowed to droop about 60 to 80 degrees from the horizontal. TV twinlead is used as feedline from the antenna to the tuner. Signal attenuation along twinlead at 800 MHz is acceptable for reasonably short lead lengths. Also, the TV tuner appears to be tolerant of the transmission line discontinuities caused by the feedline lying against objects along its path.

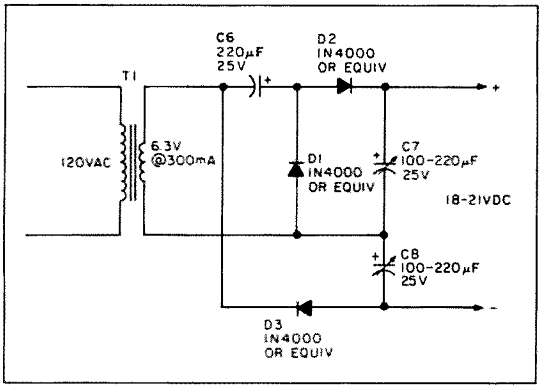

Fig. 3. Voltage tripler.

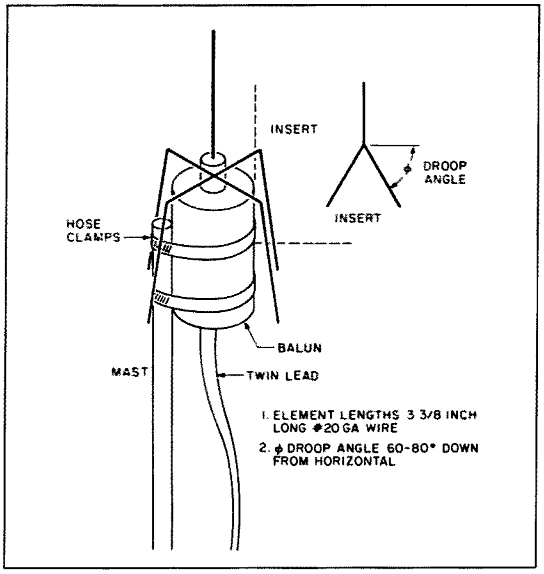

Fig. 4. Ground-plane antenna.

Obviously, the antenna and feedline are not suitable for transmitting. For an outdoor antenna, use silicon rubber material to seal the balun and antenna connections exposed to the weather. Sealant material should be used sparingly, especially where it bridges the vertical element and ground. It seems that some solvents used are conductive at 800 MHz until completely evaporated.

Join the 800-900-MHz scanner crowd the easy way by using a UHF TV tuner as a converter ahead of a scanning receiver. Follow the instructions provided in the article for a simple and easy way of listening on this band. ■

NEVER SAY DIE

from page 4

right on down to Virginia or out to Ohio. I used to take my HT with me on commercial airline flights and get permission from the captain to operate—working through repeaters all across the country from 35,000 feet. That was fun! There are too many repeaters for that these days.

When slow scan came along I set up one camera on a menu board, another on me at the operating table and a third on a slide viewer so I could show slides of my shack, the house, my wife and kid—stuff like that. It was a blast. I'd call CQ and QSL my contacts with the menu board. The main problem was coming up with new things to send—programming. No one wanted to see my same slides over again, so I found myself spending a lot of time and work on programming.

Working the pileups from a rare location is fun—a lot of fun. Oh, it can be frustrating too. Going on a DXpedition has got to be one of the most fun things hamming has to offer. I've been to Navassa twice—1958 and 1973. Both trips were unforgettable.

In 1966 I made a trip around the world. I operated from Kenya, Lebanon, Syria, Iran, Afghanistan, India, Nepal, Singapore, Australia, New Caledonia, Fiji, Western Samoa, American Samoa and Tahiti. Since I visited hams in most countries the trip was amazingly inexpensive . . . and, boy, was it fun. I ran across a day by day account of the trip recently—most of it never published. You might enjoy reading about it . . . let me know.

Back when I was in college I had a 75m AM kilowatt plus an all-band AM kilowatt I used mostly on 20m. I got settled in talking with the same bunch of hams every night on 75m—Homer W1KPL in Jaffrey NH, Bill and Olga W1IF in Peabody MA and Leo W1MLJ in Barre VT. I'd occasionally go down on 20m and relay a DX station into our 75m roundtable—making it more exciting.

The early days of RTTY were a ball. I started with a Model 12—a real old-timer which kicked up all sorts of noise as its magnets clanked. We were on 147.96 MHz with fairly wide band receivers—the old SCR-522 rigs. We used an 8220 kHz surplus crystal and that, with two triplers and a doubler, put us on channel. Our stuff was all homemade and we didn't chintz either. Our converter panels were packed with tubes which generated the 2125 and 2975 Hz tones—plus superb filters made from old output transformers—auto-start and auto-stop circuits—a clock to turn on the receiver every hour to check for traffic—auto-acknowledge the receipt of messages during unattended operation—and so on. I could set the clock on my panel to check for traffic on the hour or switch it to check at some special minute designated for messages just for my station.

In those days we weren't permitted FSK on the lower bands so I experimented with make-break RTTY keying on 80m—and worked around the country with it. Up on 11m there were no restrictions, so we worked some nice DX there.

I helped W2BFD set up one of the first repeaters on 2m almost 40 years ago! We set this up in the Municipal Building in New York and it made it possible for all of the RTTY nuts in the greater New York area to work everyone else for the first time. Yes, we had fun.

So, how about it—what have you done in amateur radio that was really fun? I'd love to get some letters I could print in 73. We might even give some of the readers ideas.

One day in 1947, five of us from my college radio club piled into my old '40 Ford and drove to the top of Mt. Greylock. I had along my SCR-522 (BC-624 and BC-625) and the 16-element beam. We had a ball working all around New England and down to New York and Long Island.

It was exciting in 1948 when I operated for several months from the top of the *Daily News* skyscraper on 42nd Street in New York—again with my old 16-element Bill Hoisington beam and my 522 rig. I was working for WPIX, the News TV station, as an engineer, so getting a spot for my hamshack on the 29th floor was easy.

I also enjoyed working 2m from the top floor of the Guggenheim Museum on Fifth Avenue, where I worked on a modern art color organ project on a Guggenheim grant in 1952.

How about the sweepstakes contest in 1951 when I operated the first weekend as W2NSD/8 in Cleveland and ran up a great score—then, the second weekend, I ran up another high score as W8NSD/2 from Brooklyn and the only equipment I used at both locations was my D104 mike.

I often remember the fun I had down in Sarasota FL where I was an announcer/engineer for WSPB and worked 6m skip all over the country as W4NSD.

So how about it—you must have had some exciting times with amateur radio. Unless you write about'em, they'll be lost.

"Working the pileups from a rare location is fun—a lot of fun. Oh, it can be frustrating too."

No, I haven't come anywhere near exhausting my own treasury of priceless ham experiences. Like talking to my home station on both 20 and 75m from Birchip Australia while visiting moonbouncer VK3ATN and hearing my signal pour in S9+ on both bands! Like working home from YK1AA in Damascus. Like working seven states on 10.5 GHz recently. Like pioneering narrow band FM in 1946. Like working W7IMW/C7, who was running 10 watts from Tsiensin, China one morning on 20m. Like visiting Robby 5Z4ERR in Nairobi. Like flying around the world on Operation World Wide in 1959 with Bill Leonard W2SKE, visiting 24 countries, and hamming on SSB all the way from our plane. Like representing the US at the World ITU Conference in 1959. Like working cross-band through my repeaters on 10 and 20m. Like hearing me making a contact with a ham in Roumania on a record Hallicrafters used to promote their radios.

When I have fun at something I want to share it. I want to interest others so they can enjoy it too. In Digital Audio magazine I'm writing about the excitement of classical music and how to get started enjoying it, hoping to get more people interested—sharing my enjoyment. In 73 I've tried to share my enthusiasms down through the years. When FM and repeaters came along I pushed the heck out of 'em and helped get hams all over the world onto FM. When I got my first Porsche in 1957 I loved it and wrote about it. The Speedster was a blast and only cost $3,300 in those days.

When computers came along I tried 'em and had an exciting time. That not only got me going with computer articles in 73, but got me to start *Byte* and a bunch more computer magazines.

I enjoy travel so I write about it and even manage to lead tours. In 1963 I took 73 hams on a trip to London, Paris, Geneva, Rome and Berlin. We had an incredibly good time—with ham parties in most of the cities. Sadly, it was while we were on this tour that the League petitioned the FCC for what they called Incentive Licensing—the worst disaster in the history of our hobby, one which still haunts us. That's when we stopped growing. I wanted to lead more ham tours, but amateur radio was so badly wounded no more ham tours have been possible.

In the last few years I've been having a great time leading tours to Asia—I'm expecting nearly 500 this year to visit the consumer electronic shows in Osaka, Seoul, Taipei and Hong Kong. We usually have a dozen or two hams along.

I almost forgot the day I worked Moscow via Oscar—that really got me excited since there was only a 20-second window for the contact. And the time I was stranded on top of Mt. Washington when the cog railway broke and my Gonset was the only means of communications from the mountain top. I passed phone patch traffic to the families of those stranded with me . . . made the Boston papers. How about the 73 hamfest in Peterborough in 1965 when we pulled more hams than the ARRL National the same weekend! Fifty years of active hamming has brought me a lot of fun—fun I want to share with you. So I want to know about your fun—perhaps you can clue me in to some things I've missed—fun I can still have.

2300 MHz Secretly Sold?

A usually reliable source within the ARRL claims to have person-

Continued on page 62

Edward F. Rice W9NGP
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Oconomowoc WI 53066

Professional Troubleshooting Tricks

Troubleshooting electronic equipment is not simply probing around the circuit looking for a loose connection or a burned component. Nor is it random replacement of parts. Skillful troubleshooters use an arsenal of specialized test methods applied to certain strategic points in the circuit. These procedures are simple, quick, and efficient. Let's have a look at some of them.

Out-of-Circuit Tests

An easy way to make a rough check for leakage, shorts, and gain of a bipolar small-signal transistor is shown in Fig. 1. You simply connect the ohmmeter leads to the collector and emitter, observing the correct polarity. Set the meter on the 1K scale. If the transistor is an NPN, as shown, then the negative lead goes to the emitter. If it is a PNP, the leads will be reversed. In some meters the battery is connected so that the positive polarity is on the black or common lead. If in doubt, check the voltage at the ends of the ohmmeter leads with a separate voltmeter.

"Skillful troubleshooters use an arsenal of specialized test methods applied to certain strategic points in the circuit."

When the meter leads are connected properly to a good transistor, the meter will show high resistance with the base open. A resistance reading less than 10K indicates leakage, and such a transistor may even produce a short from collector to emitter when higher voltages are applied in the circuit.

Now make a connection through the resistance of your moistened fingers from the base to the collection while holding the probes on the collector and emitter (see Photo A). A good transistor will show a definite drop in resistance between the emitter and collector, proving that the base has control over the collector current. This test is used by many technicians because it is easy, requires no fancy equipment, and it tells you all you need to know to troubleshoot a suspected transistor.

Diodes can also be checked using the ohmmeter on the 1K scale. With the probes in one direction the resistance should be over 50K, and it should be less than 500 Ohms when the probes are reversed. A forward-to-reverse ratio of less than 100:1 indicates a leaky diode.

Incidentally, since the base-emitter junction is a diode, you can use the ohmmeter to

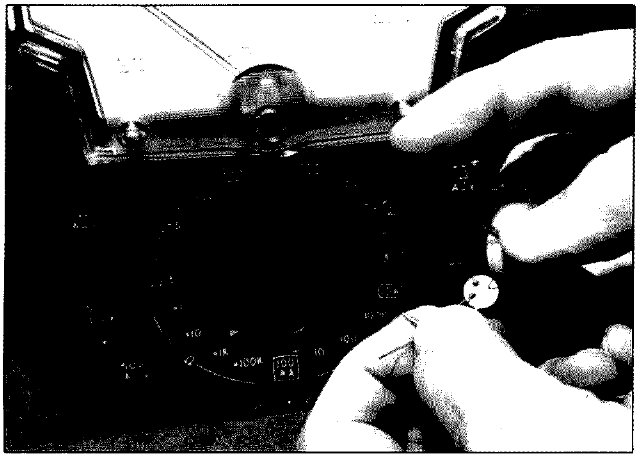

Photo A. The emitter lead and one ohmmeter probe are held in the left hand while the collector lead and the other probe are held between the thumb and third finger of the right hand. The resistance will drop when the moistened forefinger touches the base lead.

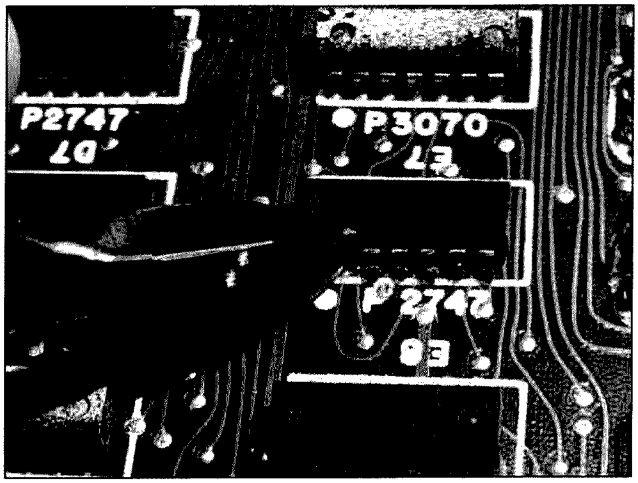

Photo B. An integrated circuit can be removed by cutting the pins close to the case. The stubs are then removed by gently heating from the bottom and pulling from the top.

help you figure out whether an unknown transistor is PNP or NPN and which leads are the base and emitter.

Note that these tests will not work on FETs because the resistance from source to drain cannot be changed unless reverse bias is applied between the gate and the source.

In-Circuit Tests

The above tests are used when the component is out of the circuit, but sometimes it is advantageous to make a quick test before removing the suspected component for further testing. The first step, if the power supply is working, is to check for overheated components. A hot transistor does not necessarily mean that it is defective but it indicates that something is wrong with this section of the circuit. An overheated resistor is usually caused by excessive current flowing in an associated part, not by the resistor itself.

The method illustrated in Figs. 2 and 3 seldom fails to find a bad transistor in a circuit where there are no other faulty parts. With the power supply connected, short the base to the emitter while measuring the collector voltage. I use a draftsman's dividers and press the points into the pads on the circuit board. With the base-emitter voltage thus reduced to zero, a good transistor will have no collector current, and its collector voltage will rise sharply.

Fig. 3 shows an alternative method whereby the base-emitter voltage is increased by connecting the base to the collector through a 10K resistor. In a good transistor this will increase the collector current flowing in the collector resistor, thus reducing the collector voltage measured to ground. If the decrease in collector voltage is very slight and you want further confirmation of the quality of the transistor, try a 4.7K resistor, but connect it very briefly.

In order for either of these tests to work well, the circuit must have at least a few thousand Ohms of resistance in the collector load—so they can't be used when the collector load is a transformer winding. However, in this case there is usually an emitter resistor and emitter voltage can be used as the indicator. There is just one complication: When shorting the base to emitter of a good transistor, the emitter voltage goes to zero instead of rising to the supply voltage as the collector voltage does. The results of the other test are also reversed. All the possibilities for each test on a bipolar transistor are summarized in Table 1.

If you short the gate to the source of a FET, the drain current will go up and the drain voltage will drop. Connecting the gate to the drain of a FET does not provide any useful information.

Tracing Toward the Power Supply

Fig. 4 illustrates a very useful technique for finding a shorted or open component. In this example, all test points are measured with a voltmeter connected between the test point and ground. The sequence of steps to locate the shorted capacitor might go like this: The technician first finds zero volts on the collector of the transistor. The next test is for emitter voltage at point 2, where he also finds zero.

The method explained in the previous section would not be used here since it is unlikely that a transistor failure could cause both voltages to be zero. It is apparent that the trouble lies closer to the power supply.

Test point 3 is checked next. If voltage were present here one would suspect an open on the circuit board foil leading to the collector. However, the voltage at this point is found to be zero also. Test 4 eliminates an open transformer winding as the cause of the missing collector voltage. If a voltage were found at test point 4, the technician would suspect the transformer and would check it with the ohmmeter. But in this case the voltage is still zero so the transformer is not suspected. When test point 5 is found to be zero, it is clear that the trouble is still closer to the power supply, so the meter probe is moved across the next component, R3. A voltage present at point 6 indicates that we have just crossed the defective part. Either R3 is open, causing zero volts at point 5, or the capacitor is shorted, grounding point 5.

You could check R3 by shorting across it, using the draftsman's dividers. If the resistor were open, a voltage would now be present at test point 5. The capacitor can be checked by snipping one lead and measuring the voltage at point 5. Often, when a part is shorted to ground, other parts in series will be damaged by the excessive current drawn through the shorted part. These associated parts need to be checked also. In this case, R1 and R3 should be examined for signs of overheating.

When the Audio Is Distorted

The problem of distorted audio is difficult because there are usually several stages in the audio section and any one of them could be at fault. It is not necessary to use a signal generator and oscilloscope to check each stage, although this might be fun to do if you have the time and equipment needed. But an easier way to locate the stage producing distortion is to make use of what is called the operating poin, or quiescent point of each stage.

The quiescent point, usually called the Q-point, is the dc voltage from collector to emitter of an amplifier when there is no signal present. Note that this voltage is not measured from collector to ground but from collector to emitter. When a signal passes through an amplifier this voltage varies up and down from the Q-point in accordance with the incoming signal waveform. But with no signal, the voltage rests at about 1/2 of the power supply. If this Q-point shifts from the midpoint between the power supply voltage and zero, then there will be less room for it to swing in one direction than in the other when a signal is applied. This results in a distorted output since the waveform will be clipped on the end where there is less room for the voltage to swing.

Thus a shift in the Q-point of an audio voltage amplifier is always

RESULTS FROM IN-CIRCUIT TEST OF BIPOLAR TRANSISTORS
shown in Figs. 2 and 3

BASE-EMITTER SHORTED	
GOOD TRANSISTOR	BAD TRANSISTOR
Collector Voltage rises Emitter Voltage drops	Collector Voltage unchanged Emitter Voltage present
COLLECTOR-BASE CONNECTED THRU 10K	
GOOD TRANSISTOR	BAD TRANSISTOR
Collector Voltage drops Emitter Voltage rises	Collector Voltage unchanged Emitter Voltage unchanged

Table 1.

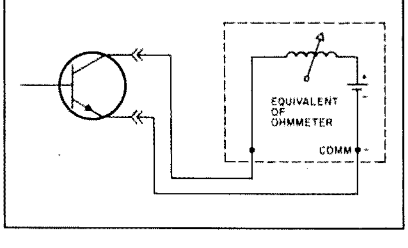

Fig. 1. An ohmmeter set on the 1K scale can be used to check transistors for leakage. Check the polarity of the voltage at the ends of the probes.

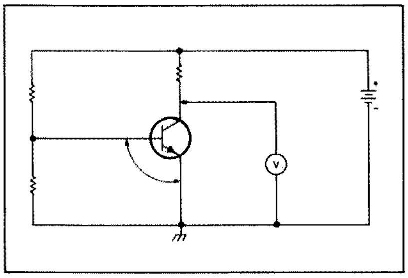

Fig. 2. If the transistor is good, the collector voltage will rise when the base is shorted to the emitter.

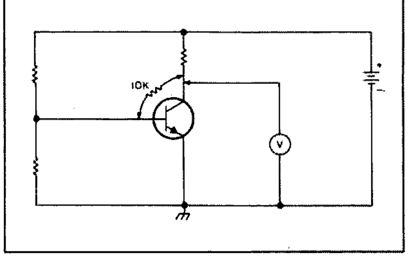

Fig. 3. If the transistor is good, the collector voltage will drop when the base is connected to the collector through a 10K resistor.

a clue that the amplifier is causing distortion. All the troubleshooter has to do to locate the faulty stage is measure the emitter-to-collector voltage of each stage. Some variations in the Q-point are normal and there is often a built-in shift of as much as 1.5 volts due to the voltage across the emitter resistor, but the stage causing objectionable distortion will show a large Q-point shift. The common causes for Q-point shift are shown in Fig. 5. They are:

- •1. The transistor characteristics have changed.
- •2. Leakage of C1.
- •3. Shorted C2.
- •4. R1, R2, R3, or R4 have changed value.

In this case, a faulty transistor might still respond correctly to the earlier tests described, so when there is distortion it is always a good idea to substitute a new transistor. But the other parts are easier to check, so they should be dealt with first. The condition of C2 can be determined simply by snipping one lead and listening to the amplifier. If C2 was shorted, the distortion will disappear, although the gain will be low without an emitter bypass capacitor. The four resistors are not likely to fail and need not be tested if they show no signs of overheating. If you decide to measure them, be sure to remove one resistor lead from the circuit board to avoid measuring other things which are in parallel.

CI is a frequent cause of distortion when it leaks even slightly. An interesting way to check for this, if you have a vacuum-tube voltmeter or one with a FET in the input, is shown in Fig. 5. If possible, loosen the end of the capacitor which leads to the next stage and connect your voltmeter between this capacitor lead and ground. Now operate the amplifier with no signal applied. The slightest indication on the meter shows leakage.

When the amplifier has a push-pull output stage, these Q-points might be much higher and this does not indicate a failure. But the two Q-points must be equal if the stage is working properly.

Methods

Troubleshooting ICs requires that you know what the chip is supposed to be doing and what each lead is for. This means that you must have the specs for the IC. My favorite source for this information is the *ECG Replacement Guide*, published by Sylvania. Besides giving the numbers of replacement units for nearly all chips, it also provides the pin diagrams.

Most ICs fall into three basic categories:

- •1.Simple gates such as the AND, OR, NOR, and NAND gates. A chip may contain several gates of the same type. A certain combination of input pulses applied to the input of a gate may produce an output voltage, or may cause the output to drop to zero, depending on the type of gate.

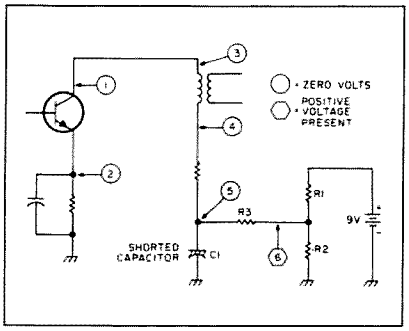

Fig. 4. The shorted capacitor, C1, is located by following this series of voltage checks.

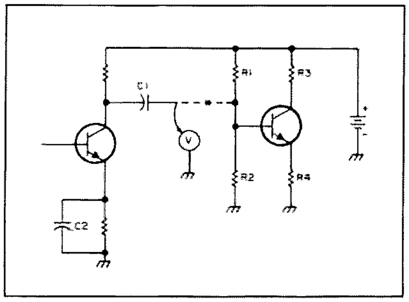

Fig. 5. Using a high impedance voltmeter to test for a leaky coupling capacitor.

- •2.Flip-flops that alternate the output voltage between two output pins every time the input is pulsed.
- •3.Op amps, containing one or more linear amplifiers that can be used in place of discrete amplifier circuits.

Obviously, you need more than the pin diagram to test these ICs. But one thing you can do, even if you have no information about the chip, is to test its operating temperature with your finger. A hot chip is probably a bad one. The only exceptions are the power amplifier type op amps and you recognize these by the heat sink.

Once you know the function of the chip and have the pin diagram in front of you, you can make a few simple tests. One method is to supply voltage so input can always be safely obtained by using a 1K resistor on the end of a wire leading back to the positive side of the power supply. Be sure you know what it takes to change the output: Sometimes you need to supply input to more than one pin at a time.

If the output does not change, don't jump to the conclusion that the gate is bad. Its output may be loaded down by the next gate to which it is connected; or the input may be loaded down by the output of the preceding gate. Keep checking until you can isolate which chip needs replacement. Sometimes it is necessary to cut the copper foil between the input and output of two chips to prevent the loading effect.

It is very unlikely that you will damage an IC if you accidentally short two or more pins together, despite what you may have heard. Certain high-frequency insulated-gate FETs can be damaged by soldering or handling the leads, but you would have to be persistent to do any harm.

A clue indicating a bad chip is the condition called a floater. This refers to the case where the output voltage seems to float around a value somewhat less than the full output voltage even when the input signal is present. Again, this may be caused by a defect in the chip or by loading from the next stage.

Op amps can be checked easily with the same 1K resistor leading back to the positive supply terminal. Op amps have two input terminals: A positive voltage applied to one will cause the output voltage to spring up to a value near the supply voltage; while input supplied to the other will cause the output to go down. So it is easy to find an op amp which is completely inoperative. The tough ones are the op amps which are only slightly defective and they still operate but not as they should. Op amps working as linear amplifiers should have a Q-point about 1/2 of the supply voltage as described previously. However, when a dual-power supply is used, the Q-point will be at ground potential.

Once you have found a faulty IC, removing it from the circuit board can be quite a challenge if it is soldered in. First, make a note or a sketch so you can remember which way the new IC goes in because it can be installed backwards. You can tell one end from the other by the shape of the case, or by a blob of paint, or a tiny indentation at one end. Two devices are commonly used to remove the solder from the pins. One is called a Solder Sucker. This will allow you to suck the molten solder from around the heated pin. The other is called Solder Wick, which is a strip of braided copper. You place the braid on the pin and heat the braid until it absorbs the molten solder.

The difficulty with both of these devices is that they may require too much heat for some circuit boards. They work well on the epoxy glass boards with reasonably thick copper pads, but when used on phenolic board with thin copper, the copper comes loose from the board if you're not careful. Photo B shows an expedient used by many technicians when they feel that the board might be ruined by trying to unsolder a chip. After the chip is removed by cutting off the pins from the top, the stubs can be removed by gently heating each one from the bottom while pulling from the top. A number 80 drill will clear excess solder from the holes after the pins have been removed.

A similar method is sometimes used to replace components such as resistors and capacitors from the top of the board. Use diagonal cutters to cut away all of the component except for the leads, which are left sticking up out of the board. The new part is then soldered to these leads.

Troubleshooting problems can be solved. It takes courage and resolve combined with a little know-how, plenty of time, and some luck. But the satisfaction of seeing a piece of gear come to life through your own efforts is one of the rewards of amateur radio you don't want to miss. ■

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Dry Cell Tester

Sort Out Those Dry Cells and Become a Household Hero.

How often do you have dry cells (1.5 volt flashlight batteries) lying around that have been pulled from handheld radios, DVMs, ohmmeters, flashlights, kids' toys, etc? If your situation is anything like mine, dry cells seem to appear out of thin air and, of course, their condition is always unknown. To combat the continuing problem, a dry cell tester (Fig. 1) was designed and constructed. The criteria dictated simplicity of operation so that any member of the household could use the tester. Therefore, need to interpret a meter scale was avoided. Of course, an electronics-oriented person prefers the analytical/diagnostic characteristics provided by a voltmeter.

How it Works

The tester is basically a "go, no-go" device using two pilot lamps as indicators. One lamp is connected directly across the cell being tested to indicate when a good connection has been made (assuming there is enough charge remaining to light the lamp), and to provide an initial load for the cell. The second lamp is used as an indicator for the GOOD/BAD decision.

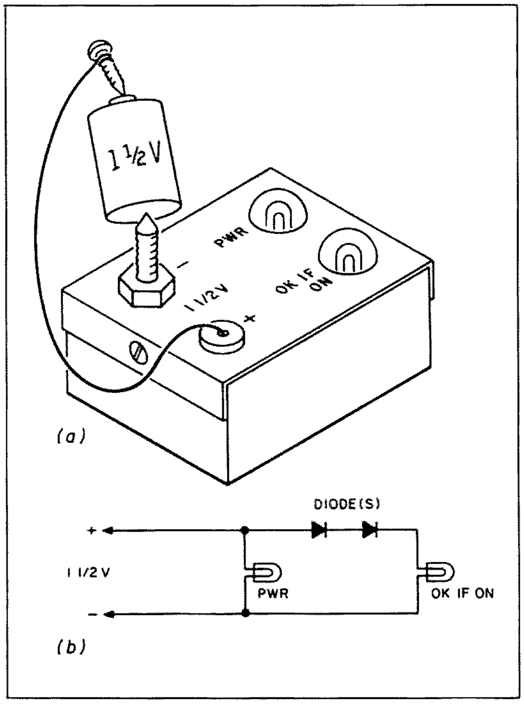

Fig. 1. Dry cell tester (a) mounting, and (b) construction.

One or two diodes are placed in series with the decision lamp to provide a voltage threshold for lamp turn-on. The decision lamp will then glow according to the cell condition (voltage level under load). It is assumed that the cell is "good" if both lamps glow, and "bad" if only the power lamp glows or is extinguished. The lamp intensity will always be low when testing fully charged nicad cells, as the cell voltage at 1.2 volts is marginal for the decision lamp.

Different lamp types have different voltage threshold values to produce a visible light output (See Table 1). The visibility of the light output is divided arbitarily into two categories for making voltage-threshold measurements for lamp and diode selection. The voltage drop, Vd, represents the voltage value required to observe a barely visible dull "red" glow. While the voltage, VL, represents a glow of "orange to yellow" for a "good" intensity level. The light visibility for lamps such as the #48 and #49 with long internal filament wires are much easier to see than the light from miniature lamps like the

Continued on page 55

Lamp	Rating V	Rating A	Glow Vd	Glow V
PR-2 (Calectro E2-430)	2.38	0.50	0.47	0.62
PR-7	3.80	0.30	0.47	0.62
#48,49 (Calectro E2-444)	2.0	0.06	0.50	0.65
RS272-1139	1.5	0.025	0.50	0.65
#114	1.2	0.20	0.50	0.65
PR-3	3.57	0.50	0.50	0.65
#14 (RS272-1132)	2.47	0.30	0.52	0.67
#222 (Calectro E2-451) (RS272-1124)	2.25	0.25	0.53	0.68
#223	2.22	0.25	0.80	0.92

Table 1. Lamp ratings.

Lamp (Qty)	1N92 (1)	1N92 (2)	1N4004 (1)	2N1305 (1)	HEP630 (1)
#48,49	R 0.9 Y 1.2	R 1.2 Y 1.5	R 1.35 Y 1.5	R 1.17 Y 1.5	R 1.0 Y 1.2
RS272-1139	R 1.0 Y 1.5	R 1.2 Y 1.5	R 1.3 Y 1.5	R 1.0 Y 1.5	R 1.0 Y 1.5
#14	R 1.0 Y 1.5	R 1.35 Y 1.5	R 1.4 Y 1.5	R 1.2 Y 1.5	R 1.1 Y 1.5
#223	R 1.25 Y 1.5	off off	off off	off off	R 1.4 Y 1.5
#222	R 1.0 Y1.5	R 1.35 Y 1.5	R 1.2 Y 1.5	R 1.2 Y 1.5	R 1.1 Y 1.5
#114	R 1.0 Y 1.5	R 1.35 Y 1.5	R 1.35 Y 1.5	R 1.2 Y 1.5	R 1.1 Y 1.5
PR-2	R 1.15 Y 1.5	off off	off off	R 1.35 Y 1.5	R 1.25 Y 1.5
PR-3	R 1.1 Y 1.5	R 1.4 Y 1.5	R 1.45 Y 1.5	R 1.4 Y 1.5	R 1.15 Y 1.5
PR-7	R 1.0 Y 1.5	R 1.35 Y 1.5	R 1.35 Y 1.5	R 1.2 Y 1.5	R 1.1 Y 1.5

Table 2. Voltage relationships for lamp/diode combinations.

NK6K > PACKET

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On the *73* August Packet Issue

As I flipped through *73's* latest Packet issue, I came across a few items that I felt needed to be set aright. Here they are:

The article *Future Packet* in the August *73* issue warrants some discussion. First, the author states that "the latest PBBS listings show more than a hundred now in operation." The W9ZRX listing as of April 1987 shows *404* in North America.

Next, the author touts the work of VE7APU a few times without once mentioning that the author sold the only commercially-available TNC based on VE7APU's hardware and software through a company called Bill Ashby and Son. While attributing the growth of packet to VE7APU, the author mentions a negative force; "a steady, well-implemented, and self-serving promotion, by various groups and suppliers of packet equipment which has created the impression that their TNC makes every station a repeater...". It would appear that this refers to the rest of the packet industry, since all of them allow digipeaters, and many include the KISS interface used to support TCP/IP, and all TNC-2 clones support NET/ROM. It must be kept in mind that the author was still advertising in December 1986 a VADC-style TNC.

The author has missed the growth of NET/ROM, TCP/IP, and TEXNET; the use of the wormhole (a satellite link between the east coast and west coast), the molehole (late-night phone links connecting NET/ROM nodes), and the Georgia 56-Kb modem.

Finally, the author mentions the ARRL Digital Committee. He says that we can't wait for this committee to agree on a level-3 network protocol, and that they've been discussing it for five years. If the gentleman really knew what the committee was up to, he'd realize that it is not the committee's *intent* to mandate a single level-three protocol. The author appeared to have a tunnel vision view of the committee—he missed mentioning Terry Fox WB4JFI, the primary author of the AX.25 specification; Lyle Johnson WA7GXD, developer of the hardware that took packet out of the hands of the few into the hands of the many; and several other people who played the real roles in changing packet from a little-discussed hi-tech preserve into a new mode for the general amateur community. I invite the author to attend some meetings; there is always one in conjunction with the ARRL Digital Communications Conferences.

The third article in the issue is several pages of BBS and Digipeater listings. The listing is difficult to use because it is sorted by callsign instead of State and City. Occasionally, because of the licensing system which allows hams to retain their original call sign even when they move to a different region, there will be a digipeater or PBBS listings in a less-than-obvious place. For example, for a digipeater in South Dakota, KA6DAC-1 is less than obvious sorted in with the sixes.

I decided to write these observations in my column as a result of some inquiries to me from fellow packeteers. Sometimes, misleading information *can* get through in articles, so I felt compelled to offer this rebuttal.

I like the ARRL and am on the Digital Committee, but I don't think *QST* has the panache to let their columnists take a poke at their editorial management.

Questions

I'm working on some graphics for the intro to NET/ROM column, so this month we'll close by answering questions from the mail.

I recently got a letter with several questions from Joe Cygman, a non-ham from Montreal. My hope is that the digital aspects of amateur radio will bring in new hams, so I'll answer these in detail in hopes that other non-hams might get interested.

Joe wants to talk to a relative in Calgary, a distance of 3000 miles. Assuming they both get licenses and the proper equipment, his questions are:

"Can we communicate in real-time, or is it only possible via PBBS systems?" Yes, you can communication in real-time. To do so today you'll have to use the HF bands. You'll either do this directly, or via HF gateways. For direct communications, you'll both need HF radios. If all you want to do is chat, you'll get more chatting done using regular voice. If you want to exchange programs or data, packet is a good way to go. To use HF gateways, both of you have to find HF stations in your local area that allow gatewaying, and can connect to the other station. An HF gateway has two radios and TNCs, one set on HF, and the other set on a second frequency, usually 144–148 MHz. Since this is an expensive proposition, most stations so equipped are used for store-and-forward messaging, which is somewhat more efficient. These stations usually do not allow gatewaying, so it is unlikely that you will find stations in Calgary and Montreal that will work for you. In the future, satellites may also provide a path between Calgary and Montreal, but it will be many months before that comes to pass.

"In real-time, how long would it take a block of data to reach that distance (assuming no errors)?" The data rate on HF is 300 baud, or about 30 characters per second. Allowing for the acknowledgments and other overhead, you're probably looking at three to four minutes for 2k of data.

"Can I talk to the States and Europe the same way?" Yep. The HF bands can be used to talk anywhere, but various propagation effects limit when and how long you can talk between any two points. Packet is not unique in this, any good ham radio or SWL book will discuss propagation effects.

"What is the minimum configuration at what price?" I always hate this question. The answer depends on if you build, borrow, beg, or buy your equipment, if you buy used, new, or top of the line, and if you want to live with propagation, or make your own. For the non-ham, making your own propagation means using the highest power possible, the biggest antennas your local laws permit, and using expensive or custom-built modems that work in low signal-to-noise conditions. A TNC will cost between $139 and $300 depending on features. There aren't many used ones around. An HF radio can cost anywhere from $100 used to $2000 and up. You need reasonable stability for long-term packet use, which means the bottom of the line used won't do. I'd guess $300–$800 would get you a minimal HF radio. HF is not the cheap way to get started in packet. Used 144–148 MHz radios can be had for $75 to $200, this is the normal entry path.

"Is there any cost to using digipeaters?" There is no direct cost, i.e., you won't be getting a bill from VE3XXX for connect time or a per-packet charge. Keep in mind though that each packet resource, be it digipeater, network node, PBBS, or whatever, has some real hardware costs involved. Some nodes, such as those on mountaintops, TV towers, or other remote locations have recurring costs such as site rental, forest service fees, etc. Many such nodes are supported by clubs, formal or informal, and somebody somewhere is paying the bills. If you are a regular user of a node, you should check in to how the bills get paid. In some cases, you can join the club and support it that way. In other cases, you can offer the services of your four wheel drive jeep the next time the node requires service, or loan a used 10 MB drive to the local BBS sysop.

"How is a digipeater different than a gateway when going long distances?" This is almost an apples and oranges question. HF Gateways get you from one gateway to another in one hop, digipeaters take several hops to go long distances. There are no digipeater paths that run 3000 miles on VHF. Digipeaters have a natural limitation on the number of hops that can be used before the probability of getting a packet from one end to the other reaches zero. NET/ROM, which can be viewed as a "smart digipeater," can be used to reach much larger distances, since it can continue to function through a larger number of hops. There are no NET/ROM paths of 3000 miles either, but through use of a borrowed satellite link, two groups of NET/ROM nodes are linked on the east and west coasts of the US. This link is too far south to be of immediate use to you.

So, to sum up, if you want a real-time link today, you'll have to use HF directly. HF gateways would work in theory, but they are limited in number and may not serve your area. Something else to keep in mind for non-hams are the restrictions on the types of traffic that can be transmitted on amateur radio. For example, if you and your relative were both software consultants, you could chat about your jobs over amateur radio. You could not, however, both work on the same job, sending source code and specifications

back and forth, to then be integrated and sold. You may not use amateur radio as a business.

Lap Tops

Ray Pitts, N6HDU, writes asking about compact computers for use with packet in a mobile home. Are lap models any good? Separating a general discussion of laptops in general from their suitability for packet, I can say that any lap top with a serial port should be fine for packet. The older laptops, like the Radio Shack model 100 all contain a built-in communications program in ROM that works fine. There was even a mini-BBS available for the MD 100 in the HAMNET BBS on COMPUSERVE. These are available for less than $400 in some places. The newer laptops are a full IBM PC, compatible in every way with normal-sized PCs. They are all big bucks, however. Most of the ones I've seen in amateur hands have been bought by an employer. There is a good deal of key clacking going on at most ham computer conferences now as people take notes or swap software.

No TNC

Bruce Langos N8CNZ asks if it is possible to receive packet without having to purchase a TNC. He has a PC and a modem. It is possible (almost anything is), but in most cases it's easier to just shell out the $139–200 for a minimum-feature TNC. Amateur packet doesn't use start bits and stop bits, it uses a frame format called HDLC, and an encoding format called NRZI. This also implies a technique called bit-stuffing or zero-insertion. All these things are described quite well in the any ARRL Handbook since 1984. While this scheme has its advantages, one disadvantage is that it usually requires the use of a special hardware chip to decode. IBM PCs don't have this chip as standard equipment. While it is possible to write a software algorithm which duplicates the hardware chip, it takes much of the processing power of your PC to do so. You end up with a $2000 computer emulating a $35 chip. Back in the early days, Bob Richardson wrote a software-only TNC for the Radio Shack model 2, but I don't think anyone has done it for the PC.

There are some inexpensive receive-only cartridges for the C-64, and I've heard of, but not seen, a software-only TNC for the Apple II done by a group in Germany. For the PC, you need some hardware. And just like modems, you can get an internal TNC board or an external TNC. HAPN in Canada makes an internal board with some nice features, it was discussed in the July 86 column. The cost is more than the cheapest external TNC, however.

There are some surplus Eagle Computer Boards around with an Intel 8530 chip on them—they can be turned into TNCs. KA9Q wrote an implementation of AX.25 in C which can be adapted to run with this board. The board was selling for less than $20.00 in Los Angeles a few months ago. You'll need a modem though, and your current modem probably won't work. Most regular 1200 baud modems use the Bell 212 standard. Packet uses the Bell 202 standard, which is very different. There are surplus 202 modems available, or you can build your own with a circuit described in the 1985 and later ARRL Handbook. As you can see, unless you get very good deals on surplus equipment or enjoy building your own, it's easier and cheaper, at least for the IBM PC, to buy a TNC. If you just want to evaluate your interest, borrow a TNC from a friend, or check out your local radio store. Three out of the four local stores in LA have demonstrators set up.

In closing for this month, remember that only letters with an SASE stand a ghost of a chance of a reply, although you may get an answer in the column. It's not the expense; I just can't remember where the envelopes are buried in the general rubble here. ■

Dry Cell Tester

Continued from page 48

RS272-1139. However, the miniature lamp works quite satisfactorily as an indicator.

Part Selection

To accommodate the threshold differences of lamps, it is necessary to select a particular diode (or two) to be used in series with the decision lamp. The diode selected, though, must be capable of handling the lamp current. In general, two germanium diodes are preferred over a single silicon diode since a fairly critical decision voltage is required to discriminate between a good and bad cell. A typical silicon diode will drop aproximately 0.7 volts while two germanium diodes in series will drop about 0.6 volts.

Regardless of the diode used, the forward voltage drop across the diode will be dependent upon the lamp current and the shape of the diode's forward saturation knee. At the low lamp currents, the forward voltage may be slightly less than the typical 0.3 or 0.7 volts respectively for germanium and silicon. Because of the various shapes of the diode knee vs. current, it is difficult to select a particular diode without experimentation. The base-collector junction of a 2N1305 (RS276-2007) germanium transistor was found to have nearly the same voltage drop as two 1N92 diodes connected in series.

Construction of the tester is intentionally simple, with a small box used as an enclosure.

If the cell voltage exceeds 0.6 volts (two germanium diodes), current will flow through the decision lamp but the lamp will not have a visible glow until the cell voltage is above approximately 1.2 volts. The higher voltage drop of a silicon diode would cause the lamp to be dimmer in most cases. Nine lamps were categorized and listed in Table 2 to show the variables of lamp vs diode/voltage to assist the builder in selecting matching parts. The #48 or #49 lamp used with two 1N92 diodes is the preferred combination, but other combinations will work fine with some experimentation.

Construction

Construction of the tester is intentionally simple, with a small box used as an enclosure. The lamps are mounted (held) in rubber grommets with connecting wires soldered directly to the lamp bases. It is best to keep the heat to a minimum to prevent glass fracturing when soldering the lamps. If desired, the diodes may be mounted on a three-lug barrier strip to provide mechanical rigidity. Number 4 or 6 machine screws are sharpened to provide cell contact. The positive-terminal probe screw is attached to the end of a flexible wire which is made long enough to reach easily over the top of the dry cell.

Build this simple dry cell tester and put it to use in your house or ham shack. You can now clean up that pile of "unknown" dry cells on the workbench as well as those left in the refrigerator since Christmas. Become the household hero! ■

QRP

Mike Bryce WB8VGE
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BICYCLE MOBILE QRP

Well, let's face it. Sometimes ham radio can be as exciting as tapioca pudding. Summer always wins out over staying indoors and playing with the radios. But, if you're a QRPer, you know firsthand that there is nothing stopping you in taking the gear out into the world.

Small, lightweight QRP radios lend themselves readily to mobile/portable operation. Field day is a good example of the portability of low-powered equipment. Well, several months ago I mentioned that I like to go bicycling, and I have been working on a small transceiver to take along with me on the rides. I was thinking of riding out into the countryside, stopping, getting the radio out, and making a contact or two underneath a shady maple tree. Cam Hartford N6GA sent me a letter and asked if I would be interested in hearing about his efforts in bicycling and QRP, to which I enthusiastically responded.

Cam decided to go me one better. I was going to be extremely happy to be able to carry, set up, and operate a portable station while sitting under the ol' maple tree eating GORP (Good Ol' Raisins and Peanuts). Cam was going to operate while riding his bike down the road. Well, I'm impressed! So, in Cam's own words, here's the following on setting up a bicycle-mobile QRP station:

"I ride my bike for fun and exercise, not for speed. Most weekends, I go out for a 20- or 30-mile ride, with an occasional 50- or 100-miler thrown in, just to keep me humble. It was during one of these longer rides that the thought of integrating my two hobbies occurred to me. At the time, I was already in the process of building an ultra-compact 40-meter rig (Roy Lewallen's W7EL Optimized QRP transceiver, *QST*, August 1980) for home use. All I needed was an antenna, a matching network, and a method of keying the rig.

"The antenna was easy. I purchased a 40-meter mobile whip for a few bucks at the local flea market. It is a helically-wound fiberglass mast with a stainless-whip top section, and only weighs a few ounces. A borrowed rear bike rack, a Hustler ball mount, and the antenna portion was complete. The ball mount clamped to the rack very easily with two bolts and a short length of 1" x 1/8" steel bar. The only effects I feel when riding with the antenna aboard are from the low-hanging trees I neglect to avoid.

"Matching the rig to the load was a little more challenging. The antenna was resonant, but at a pretty low impedance. The bike, however, doesn't provide much of a mass at 40 meters, so the system impedance was pretty screwy. I tried several combinations of L networks, but didn't have much success with them. One combination seemed to provide a good match, but a check with the field-strength meter showed that the power must have been going into something other than the antenna. Maybe it was heating up the contents of my water bottle. It's always a good idea to use a field-strength meter in conjunction with the noise bridge and swr bridge in an antenna project such as this.

Photo B. You've got to keep an eye out for low-lying power lines on this thing!

"Finally, in frustration, I set my MFJ-949 antenna tuner on the rear rack and put it in the line to see if it really was possible to match this thing. About thirty seconds later I had a good match and the field strength meter was off-scale. The MFJ tuner is not the kind of thing you want to cart around with you, so I duplicated its T-match circuit with some small air variables and a tapped toroid in a small Radio Shack project box. It works like a charm, is small, and very light.

"Once I got the antenna mounted and matched, I took off for a ride just to listen to the thing to determine if it was possible to copy CW while pedaling. I still don't know. What I had created turned out to be a very elaborate noise generator. I had expected the bicycle to be a very quiet radio environment, free of ignition, alternator, and all the other noises one associates with a mobile environment. Try to imagine the wheels spinning, their bearings making and breaking contact between the axle-bearing surface and the wheel-bearing surface. Also try to imagine the chain spinning around, each little link sporadically making contact with each other little link. Each contact made and broken represents a change in the impedance of the antenna; something like a loose connection in your antenna system. The direct-conversion receiver translates all of these changes into noise.

"At speed, with the wheels spinning and the pedals cranking, it amounts to about an S-9 noise level. Only the strongest of signals get through, leaving out most QRP-ers. Even when standing still, the simple act of turning the handlebars creates a good, solid S-6 hash.

"A quick check of a few older *Handbooks* didn't reveal anything that seemed applicable to this case. Wheel-hub contact springs just won't make it on a ten-speed. Bonding all moving parts together with copper straps would probably work, but what good's a bicycle with wheels that don't turn? I finally had the thought that part of the problem might be the direct-conversion receiver. While Roy's design is one of the better dc receivers around, it occurred to me that it might not be well-suited to this application. To find out, I tried some other rigs in the same environment. An HW-7, an HW-9, and a home-brew superhet receiver were all subject to the bicycle-mobile environment. The HW-7 flunked, exhibiting noise characteristics similar to or worse than the W7EL radio. The other two rigs, both superhets, were very quiet. Neither seemed to be affected by the moving parts of the bike.

"It now appears that my project list has grown to include an ultra-compact, 40-meter superhet transceiver. It could prove useful on Field Day, too!" ■

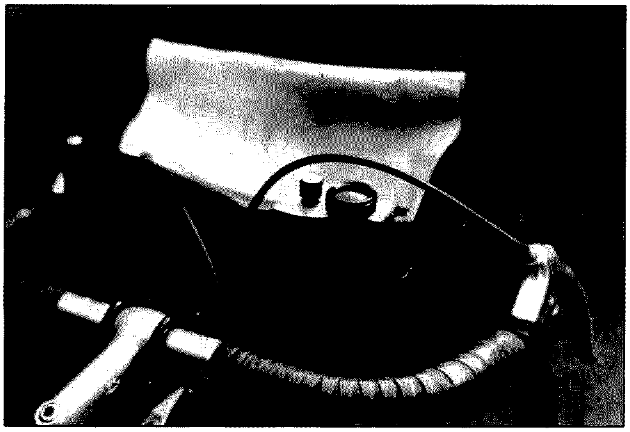

Photo A. The rig sits in the pocket of the handlebar bag and is easily tuned while riding.

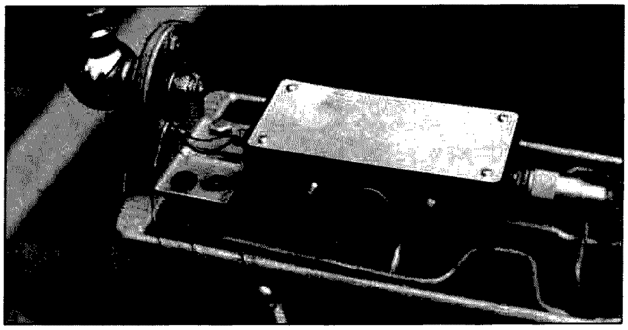

Photo C. Close-up of the antenna mount and matchbox.

WEATHERSATS

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ANNIVERSARY

This is the first anniversary of the WEATHERSAT column and I must say it has been fun. I only hope that it has been useful as well. This month we are continuing with a discussion of the SMARTFAX concept, so, if you are tuning in after a break, you had better read last month's column to get up to speed. Last month we spent most of the time looking at hardware and software considerations. We will wind that up this month and then look at the construction of the SMARTFAX recorder—something that won't take long at all!

THE SMARTFAX RECORDER

The basic SMARTFAX recorder is a 240-lpm drum-type system using electrostatic paper that will print an 800-line image in about 3 minutes with near photographic quality. The basic mechanics for the recorder involve simple items such as a plastic rolling pin, aluminum angle stock, and other hardware-store materials. The construction of the recorder mechanics is fully described in the *Weather Satellite Handbook (WSH)** and although it is simple enough, the documentation is too lengthy to repeat here. The important thing to note is that we are going to build only the basic mechanics package—not the video, control, timebase, and drum amplifier circuits. You will be using the mechanics but essentially none of the electronics, with the exception of the 300–350V supply for the stylus.

The total cost of the recorder, everything included, should be well under $200, with the major items being the 240-rpm synchronous motor for the drum and the 40-rpm synchronous motor for the stylus drive. Both of these items can be obtained from the Hurst Manufacturing Company, outlined in the *WSH*. Met-sat Products, one of the suppliers listed in the book, still has a stock of high-torque motors left over from final production of their FX-3 FAX recorder, and these can be obtained at a considerable cost-savings over new Hurst units.

The electronics for the recorder are shown in Fig. 1. For any of you experienced with FAX systems, they will look totally inadequate, but have faith. In a short while I will show you how we can do without most of the circuits you are used to seeing.

Motor Drive

In this system, both the drum and stylus drive motors are operated directly from the ac mains, a departure from conventional FAX practice where the drum is driven, via an ac amplifier, from a precision frequency source. Ac comes from the control unit (see packaging below) and normally will be applied through a relay (K1) when the control unit is turned on, applying ac to both the drum and stylus drive motors and activating the unit. Exceptions to the normally ON condition are covered in the *Safety Interlock* discussion below.

Printing Driver

The paper used in this recorder (paper sources are covered in the *WSH* documentation) requires that printing voltage be applied to the grounded paper surface from a wire stylus. The printing voltage must vary from about 240V for black to 30V for white and must be controlled from the output of the D/A converter in association with the computer. In the case of the CoCo, the video control voltage (CVID) is available directly from the cassette output line with no additional hardware required. The operation of this circuit is identical to that of the normal *WSH* printing circuit except that in this case we get our video drive from the computer, not the FAX video circuits.

The modulated stylus voltage from Q2 is routed through the second set of contacts of K1 as part of the safety interlock system, described below. Meter M1 provides a relative indication of stylus printing voltage for system setup and to verify printing.

Drum Position Indicator

Virtually all drum-type FAX systems require some means to indicate when the drum has reached the position that should be the start of a line. This can take many forms. In the first version of the SMARTFAX recorder I used a simple microswitch activated by a cam on the drum shaft. The cam was positioned so that the switch would close, grounding the "phase" line, just as the stylus started to traverse the left edge of the paper. The first pictures had a very pronounced "jitter" that I thought might be due to irregularities in the closure of the switch so I changed the system to the use of a small magnet, mounted on the drum, and the use of a small Hall Effect sensor that would put a logic LOW on the "phase" line. The "jitter" was still present and turned out to be due to a slight binding of the drum shaft! A simple switch *will* do the job although you could use a magnetic switch, a magnetic Hall Effect sensor, or an optical sensor. The switch (S3) approach is shown, but regardless of what you use, you want the "phase" line to go to ground or a LOW just as the stylus starts its scan of the paper. The "phase" line is connected to the left joystick port of the CoCo (what would normally be the joystick "fire" switch) and the computer can easily sample this

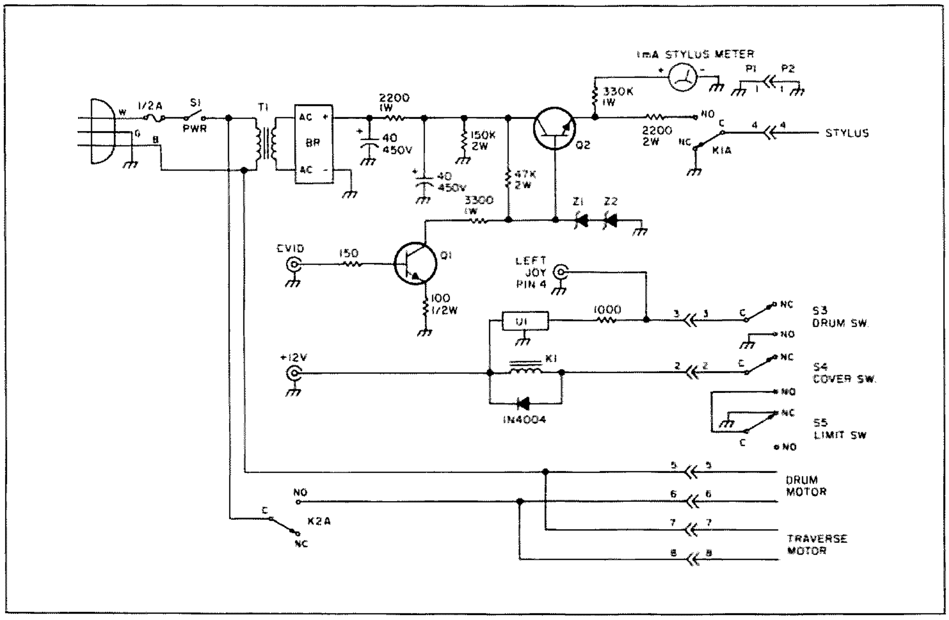

Fig. 1. SMARTFAX electronics. T1 is a transformer that will deliver between 200 and 275V on the secondary at 100–150 mA. BR is a bridge rectifier assembly rated at 600V and at least 1 Amp. Undesignated resistors are 1/4W. Z1 and Z2 are 120V 5W zener diodes (SK120X/5158A or equiv.). Q1 is a 10W, 300V (1A) transistor (SK3044 or equiv.). Q2 is a Motorola S5020 but any power transistor with a collector rating of 500–700 volts can be used. K1 is a 12-V-dc DPDT relay, the stylus voltage meter is a 1 milliamp panel meter, and U1 is a 7805 5-V-dc regulator. P1 is a Cinch Jones S-308-AB chassis mounting socket (control unit) while P2 is a P-308-CCT cable mounting plug for the 8-conductor cable from the printer mechanics. S1 is a SPST toggle switch while S3–S5 are SPDT microswitches. Wiring to P1 and P2 and the microswitch designations and wiring match the system described in the WSH.

line to determine the start of a video line.

Safety Interlock

Two "bad things" can possibly happen during recorder operation. One is if the stylus carriage reaches the end of its travel and the system keeps on running. This can happen if you leave the room for coffee, if you aren't watching, or if you failed to reset the stylus carriage before printing. Consequences are not good in this event as you will grind away at the drive rod, probably burn through the recording paper as the stylus prints away while the carriage is stalled, and you will cause the stylus drive motor to soak up lots of excess current.

Bad thing number two occurs if you touch the stylus during printing. 240V or even less can be fatal!

Both of these bad things are eliminated by a safety interlock system consisting of two microswitches (S4 and S5). Both are in series with the coil of the 12-V-dc control relay, K1. K1 must be closed to apply ac to the drive motors *and* printing voltage to the stylus. The interlock system is based on allowing K1 to close only when everything is just fine but forcing it to open if things are somewhat less than fine. Less than fine is defined by the status of S4 and S5. S5 is located at the end of the stylus track and is wired using the common and normally closed contacts of the microswitch. The switch is positioned so that the carriage will cause the switch to close, breaking the series ground to the coil of K1 when the carriage reaches its limit of travel. This would cause S5 to open, would release K1, and thus shut down the motors and remove voltage from the stylus.

S4 is wired using the common and normally open contacts of the switch and the switch is arranged in conjunction with a cover of plexiglass or other rigid material so that the switch will close when the cover is on place over the drum, shielding you from accidental contact with the stylus. If you fail to close the cover, K1 will not pull in, the stylus will be held at ground, and the motors will not run. Open the cover partway through printing and the system will also shut down.

The interlock system is designed to protect both you and the hardware, not to mention uninformed visitors to your station. The cover interlock is a *must*. You should omit the "end of travel" function only if you know that you will never forget or be called away. Since that is not realistic, a buck or two for microswitches is a prime investment in peace of mind! THE UNIT IS NOT SAFE TO OPERATE UNLESS THE INTERLOCK CIRCUIT IS FUNCTIONAL. DISABLING THE INTERLOCK FUNCTIONS MAY RESULT IN DAMAGE TO THE UNIT AND COULD PROVE FATAL.

Packaging

The power supply, printer driver circuit, meter, and power switch were all placed in a small metal cabinet—almost anything will do. Connection to the actual recorder mechanics package is via a 6-conductor cable. The cable originates at the printer and has a Cinch-Jones plug (P-306-CCT) that mates with a socket (S-306-AB) on the rear apron of the cabinet. You must *not* use a plug at the recorder end since the exposed pins would be carrying both 115 V ac and +300 V, both of which are hazardous to your health. Any ac and HV connections at the recorder should be enclosed in a minibox or other grounded cabinet for safety.

A shielded audio line (phono plugs at either end) carries the cassette output line from the scan converter to the SMARTFAX cabinet (CVID). Another shielded line, with a phono plug at one end and a 6-pin DIN plug at the other, routes the "phase" line from where it enters the SMARTFAX cabinet (from the recorder) to the left joystick input of the CoCo where the "phase" line is connected to what would normally be the "fire switch," if we were actually using a joystick.

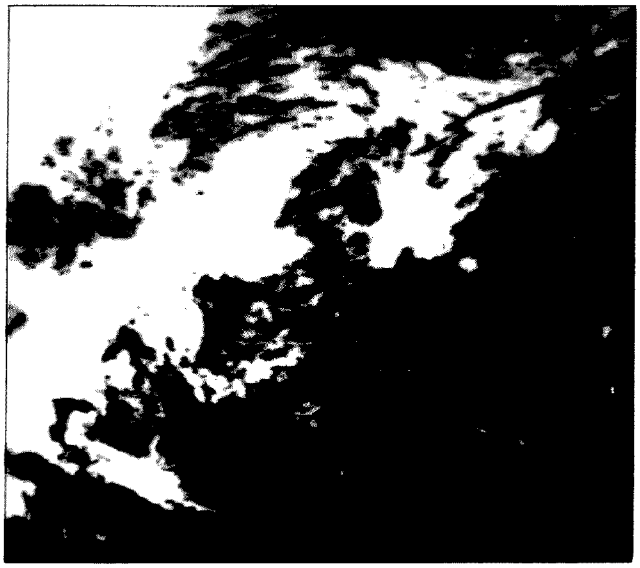

Fig. 2. A METEOR 2-15 image from the WSH *scan converter which was dumped to a 120-lpm Alden WEATHERCHART recorder. The major disadvantage of the Alden, aside from the longer printing time, is the fact that the Alden printing circuits are optimized for binary printing of weather charts and the mid-range video values are hard to display. This is the same pass shown in Fig. 2 last month, but that image was printed on the SMARTFAX recorder which is optimized for grayscale output. If I were to use the Alden unit on a permanent basis, I would redesign the printing circuit for linear grayscale response. Dumping to the Alden from the* WSH *scan converter presents no real problem—just slightly different software. Baseband video was used for this print, but the output signal from the computer could just as easily be converted to subcarrier FM for direct input.*

Construction and Setup

The *WSH* provides a detailed description of the construction of the recorder mechanics. Wiring of the control cabinet is straightforward with no necessary cautions other than those normally associated with ac and HV wiring connections. Q1 and Q2 can be wired into a piece of perfboard mounted on standoffs.

Without connecting the recorder, turn the recorder power switch (S1) on and observe the stylus meter (M1). You should obtain a reading of approximately 0.7. A voltmeter should be used to carefully (= safely) measure the voltage between pin 2 (+) and pin 1 of the recorder socket. You should get a reading of about 240V. With equal care, measure the ac voltage between pins 5 and 6 of the same socket—you should get something between 110 and 120 V ac, depending upon your local mains supply. Now turn the power switch off. The ac voltage should drop immediately to 0 and no high voltage should be present between pin 2 and 1 (measured previously). The stylus meter should still be indicating voltage but this should taper off within a few seconds unless you have omitted the bleeder resistor on the HV supply.

At this point you can plug in the cable from the recorder. With the power switch off, block the stylus arm up so the stylus will not touch the drum, and reset the stylus carriage. Close the cover and turn the power switch on. The drum should immediately begin to rotate toward the back of the recorder and the stylus carriage should begin to move along the track. Open the cover and both motors should stop. Close the cover and allow the carriage to move down the length of the track. While it is running you can use an ohmmeter to verify that the "phase" line to pin 4 of the recorder cable socket is being pulled to ground (or LOW) once each drum revolution. As the carriage reaches its limit of travel, it should activate the limit switch at the far end of the track, and again both motors should stop. If either motor turns in the wrong direction, recheck the wiring. If either interlock fails to function, unplug the recorder cable and carefully check the wiring and/or placement of the cover and limit switches.

Software

Prior to the final description of using the SMARTFAX recorder, a few notes about the operating software are in order. The SMARTFAX software is available as an option that can be grafted into the standard Version 4 software which I supply for the CoCo version of the *WSH* scan converter. The standard Version 4 software is available for $30 on cassette or $40 in EPROM. For the SMARTFAX option, simply add $5 to the cassette or EPROM pricing. The SMARTFAX option is called from the Main Menu, at which

point the computer will output white-level video and wait for you to turn on the control unit to start printing. The software will hold a constant white level until the computer detects eight pulses on the "phase" line, which provides enough time for all of the motors to come up to speed. At the ninth pulse, the computer will begin to dump lines to the SMARTFAX recorder. With each pulse the computer will proceed to step through 1000 pixels of data (500 bytes) using the normal clock signal from the scan converter to time the dump. After 500 bytes the computer will jump ahead 12 more bytes in memory and wait for the next line pulse from the recorder. This is how we can use the ac mains for running the drum since the computer dumps the first 98% of each image line and then waits for the drum to finish a revolution before starting the next line. Thus, while the drum may run either fast or slow in absolute terms, the computer is dumping to the drum in a triggered mode and we get a properly synced image despite a slight "wandering" of the ac drive frequency. The loss of the last 2% of each image line is a small price to pay for the convenience of using the ac mains for power!

Use

The *WSH* has a rather complete description of the paper-loading sequence. You simply need to be sure that the cable from the mechanics is plugged into the control unit and that the cables to the cassette output and left joystick input of the computer are in place. Load a sheet of paper, reset the stylus, and forget about the printer until you see an image you want to save!

Assuming you have an image "frozen" on the display, key in the SMARTFAX option from the Main Menu (#8) and turn on the SMARTFAX control unit. As the drum comes up to speed, you will see a few white lines as the computer counts drum pulses and it will then begin to print out the picture. When all 768 image lines have been dumped, the computer will switch back to constant white output (which will be evident on the paper and on the printing meter) and you can switch off the control unit and remove your print. If you forget to switch off the printer, the end of travel interlock switch should shut the system down for you.

If you haven't closed the cover prior to turning the control unit on, the system will not print but there is no need for panic—the computer will *not* start the dump until the drum has been running for eight revolutions. Simply close the cover and printing will begin normally. If you want additional copies, simply reload paper and print another.

Normally, I will keep the system loaded with paper at all times so that I can print a desirable picture with minimal delay. It may seem strange to be printing pictures *after* they have been transmitted, but you will certainly appreciate being able to decide whether a picture is worth saving without having to use up paper to do it!

Pix of the Month

Fig. 2 is provided for the benefit of those folks who want to see what a non-satellite FAX machine can do. In this case, the FAX system is the Alden Weatherchart recorder (120 lpm) while the image is a METEOR product! The software in this case provides an initial phasing signal to allow the image to be phased on the Alden, a 120-lpm dump rate (all 1024 pixels/line), and repeats each line twice to get the proper aspect ratio. The only disadvantage in the case of the Alden is that the dump requires about 12 minutes instead of the three minutes needed for the recorder described this month.

I think you will agree that SMARTFAX is a very effective merger between the viewing ease and mode flexibility of scan converters and the high-resolution printing capabilities of FAX recorders! I would definitely suggest that you look at the possibilities presented by the SMARTFAX concept, for the results are certainly superior to basic photography or video printers.

Next month we will have our first encounter with the wonderful world of digital image processing.■

* References to *WSH* are to the Third Edition of the *Weather Satellite Handbook*, available from the author for $12.50 plus $1 shipping and handling in the U.S., and $2 elsewhere.

73 Magazine Product Report Card

Please rate any ham gear you're using from (0) poor to (9) superb.

MANUFACTURER	MODEL	YOUR RATING	WHEN PURCHASED	NOTES
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NEVER SAY DIE

from page 42

ally seen a memo of agreement with an undisclosed investment group to sell them the amateur 2300 MHz band for an undisclosed sum. Rumors put the deal in the $500 million range. I sure hope this isn't the usual leveraged buyout, complete with junk 2300 MHz bonds.

The League, I believe, claims that since its 145,000 membership represents almost 100% of the actually active amateurs, it thus has the right to enter into a contract to sell the amateur bands on behalf of all amateurs.

I don't think any of us have any argument with the reported proposal to earmark $50 million of the proceeds for updating the ham shacks of League officials, directors and vice-directors. They, obviously, as our representatives, should have the very best in equipment and antennas. Nor have we any problem with the proposed new $100 million 30-story headquarters building, museum and visitor center, including a new W1AW, with operatorless computerized continuous CW operation on all bands, complete with the automatic printing and mailing of the QSLs. It's about time, really.

I personally feel that $50 million set aside as an additional retirement benefit for headquarters staffers could be trimmed a bit. I also feel that the proposed $1,000 for the promotion of amateur radio might be increased—perhaps even doubled—or at least made a yearly investment.

We've been wanting to be able to have special call signs for several years, so an investment in a computer system to permit this innovation is long overdue. I believe that by charging $1,000 for each special call, the investment could be returned in just a year or two. It doesn't take anything to stir up controversy with some ops—such as the proposal that charges for special calls be graduated according the number of call characters. A six-character special call might thus cost only $100. A five character $500. A four character $1,000. Three might be $5,000. Two might be $10,000 and one might be $100,000. Cheap enough, I say. I know I'd jump in a minute for "W"—even at $100,000. I don't think I'd go more than $50,000 for "K"—and they can take "N" and shove it.

Hey, now that our call numbers are meaningless, why not start issuing five letter calls—like WAYNE? GREEN? I'll take two of those. Too bad if you have a long name—hey, don't blame me, that's your folks fault, so worry them about it. Change your name—it's not difficult. Or start going by a "sine" like the old CW ops. I've been a W2 in the W1 district for 25 years now, so what do numbers tell you anymore?

If they really are selling that stupid band which we've never used and which we'll probably never use, I wonder what they'll do with the rest of the money. Wow, what a party we could have! Or how about official ARRL DXpeditions to the top 100 most wanted countries? With a budget of $100,000 for each trip that would only run $10 million—peanuts. But it sure would get DXing back into the spotlight. We'd want to make sure that the DX operation was totally automated though, with each contact kept down to one or two seconds so eager-beaver DXers could work 100 rare countries in 100 seconds. That'd sure make the papers. Think of the thousands of CBers we'd suck into the hobby with a deal like that! Maybe tens of thousands. We might even attract some of those thousands of stuck-up 10.5 meter ops. I wonder if we could locate L. Ron Hubbard's old ship and set it up for DXing? Was it the *Excalibur*, named after his book? The old *Excalibur* was the flagship of the American Export Steamship Line, which used to be America's biggest passenger line. The *Excalibur* was sunk off Northern Africa in WWII, as I recall.

Isn't it about time we put those three stationary synchronous satellites up so we can contact anyone in the entire world using microwaves? A project like that would eat into the kitty—particularly if we do it right. I'm talking a major computer system to control the satellite relaying—one which could keep every active amateur's location noted with store and forward features for messages. All these newfangled ideas take is some money to make them work.

Of course, if we're going to start using satellites for any volume of communications, we might just have a need for the 2300 MHz band and regret selling it.

How about you—what would you like to see done with an extra hundred million or two for the League to invest in the hobby? Let me know what you think. Also, if you believed the above, I've got a famous old bridge in New York which we're forming an investment team to buy, set up a toll booth and make a mint.

Wayne in Yalta

Old-timers, which includes most of us hams who are still left today, will remember the old black and white TV sets with controls for vertical and horizontal sync, vertical and horizontal linearity, focus, brightness, contrast and so on. The almost forgotten old TV days came rushing back recently when I turned on a TV set in Suzdal, Russia. I was back forty years to my first TV set! The old 630TS.

> ***"The food was okay—most of it on par with a cheap American diner—plenty of it."***

I was sucked in when a travel brochure came inviting me to join my RPI alumni on a two-week trip to the USSR. The price wasn't too bad, and I've somehow managed to miss visiting Russia before. . . so, what the heck, right?

My first move, over three months before the trip, was to write to the head of amateur radio in Russia, Yuri Zubarev, and ask to meet him during my visit. I also wrote Box 88, as a backup. And, just to try and cover all bases, I quickly answered a timely offer to help with material for *73* from Information Officer Andrei Baidak of the Soviet Embassy with a third request to see hams during my visit—mentioning I'd written Zubarev.

Not hearing from Andrei after a month, I started trying to reach him by phone at the Russian embassy. After two weeks of either busy lines or no answer at all, plus sending him two telegrams—I was told that Andrei had returned to Moscow—permanently. A few weeks later, when I finally reached his replacement, Michael Nakoryakov, he said he was very sorry, but it was too late now to do anything.

A note from Radio Sport Federation VP Kazansky, replying to my letter to president Zubarev, said sorry, I'd have to use diplomatic channels—period. I was disappointed, but not really surprised.

Pat McGovern, the International Data Group chairman, suggested I try Alexei Markov of the USSR Trade and Economic Council in New York—a contact that had worked well for him. A few days trying to reach Alexei got me the word that he, too, had been returned permanently to Moscow. When his replacement arrived and called, he asked for information on my background. He later called again to say he'd sent everything to Moscow and believed I would be well received there—and would call if he heard more. No call.

When the time came to go to Moscow I wasn't expecting anything more than a routine carefully orchestrated two-week tourist visit to Russia. There was no word from anyone while I was in Russia, so I just toured. They've worked out a program which keeps tourists busy almost every minute they're not sick—with long rides in hot buses with sealed windows, making it impossible to take many good pictures—lots of standing around waiting—and the only contact with the Russian people our carefully trained Intourist guide—who was not even permitted to give us her last name or address.

We had 36 in our group—just right for one bus—only five were RPI alumni, with the rest from other colleges. Most were retired and none with any interests I was able to discover.

We started out with two days in Moscow—a bus tour of the city where our guide identified and gave us the date of building and the name of the architect of every museum, church, government building, institute, and hospital as we zipped by—then we stood an hour on line in the hot sun in Red Square to see Lenin's tomb—yep, sure enough, there he was, nicely preserved, but NO pictures permitted—we were allowed five minutes to shop in the famed GUM department store. Yes, I said five minutes! A visit to three metro stations—which must have cost a

bundle to build—'30s type decoration. Subway fares were cheap and trains came along every 90 seconds. No graffiti—yet.

So much for Moscow. The third day we made an all-day bus trip to Vladimir and then on to nearby Suzdal. We spent two days in Suzdal, a small town (11,000) whose only business is entertaining about one million tourists a year. Tourists are a major source of hard currency for the government, which it needs badly to buy state-of-the-art computer-controlled submarine propeller-making equipment from Japan. Suzdal was fun, with some people in costumes dancing, crafts people crafting, and so on. But two days?

Then one full day traveling—the five-hour bus ride back to Moscow with a bag lunch on the bus—waiting at the airport—a two-hour flight to the Ukraine—more waiting—a two-hour stifling bus ride to Yalta—arriving just in time for a late dinner. Two completely organized days at Yalta and then back up to Leningrad, north of Moscow. At Yalta there's a boat trip ($11 extra)—a city tour—museums and a swim in the Black Sea, which was cold and brackish.

The food was okay—most of it on a par with a cheap American diner—plenty of it. There are no bananas in Russia—come on, commissars, get your boy Castro on the ball. I was able to buy milk at a grocery store in Moscow, but it was never served in a restaurant. It was usually impossible to even get milk for coffee except at breakfast.

Being kept in a tightly controlled group with few photo opportunities may serve the USSR's purpose of getting hard currency tourist money, but it sure was frustrating for me. I knew I was seeing only what they wanted me to see—what they'd carefully planned for me to see.

They couldn't hide the endless queues for food—queues from one end of Moscow to the other—queues in every small town we passed. Queues even at midnight.

I didn't think it polite to bring up with our nice tour guide—the only Russian we ever spoke with—about Communism having never been a success as an economic system in any country it been tried. I read there are hopes that *glasnost'* will help, but I doubt it. I expect we'll see a repeat of the China pattern, where some free enterprise was permitted and then the inevitable reaction set in.

The insurmountable problem is simple. When free enterprise is allowed in a communist society the ruling group—the bureaucrats—the people enjoying privileges (big apartments, summer houses, cars, the best food, imported clothes, theater, etc.)—are unable to benefit from the change. They see new people achieving wealth and power and vying with them for the perks, which threatens their hold on the country, so they have to stop this nonsense. See if there isn't a government reaction against free enterprise in a couple of years in the USSR just as there has been in China.

Russia recognizes, as does China, that technology is critical for their future. Yet without changing their system they're not going to be able to generate the millions of engineers and technicians they need to cope with technology. Without another revolution there's no way their system can change—which is why the Chinese youngsters went into the streets in protest over their system—and were quickly shut up by the police. How long before Soviet students are threatening revolution? We'll see.

By the way, if you've worked much DX, you've contacted many Russian hams. Think about it—how many have you ever really talked with? It's my understanding from several sources that only KGB agents are permitted to have ham licenses which enable them to talk internationally, other than via radio club stations.

As our group went around we kept seeing opportunities for business. Someone will eventually invent Kleenex and make a bundle. Ditto American-style toilet paper. I saw no fast food stands in Russia, probably because so few people have cars and food is in such short supply. They haven't invented the superhighway yet—of course China has just barely invented roads, so I suppose Russia is ahead in that respect. But it sure makes for slow travel, with 30 miles in an hour about par.

Let's see what we can do when we hear a Russian radio club station to draw the operator into a conversation. Yes, I know most of their rigs sound so awful it's all you can do to make out the call and operator's name, but we need them to hear us more than we need to hear them. Tell them you'd like to get to know more about their country and their daily life—explain that your second car hurt itself pulling your boat, so you've had to make do borrowing your kid's car for a couple days or else give up picnic trips to the local lake. Tell 'em how frustrating it was yesterday when you had a two-minute wait in the check-out line at the supermarket.

Nah—I'm being rotten again. You just go ahead and make your usual one minute contacts and get your QSLs from Box 88 like you always have. Let's not try to use amateur radio to penetrate the Iron Curtain. And, no way send any Green QSLs. Senator Humphrey suggested I bring up the subject of their getting the hell out of Afghanistan, but I think he may have been more interested in getting me out of his hair than improving my trip.

I attended a "cultural discussion" at Yalta where it was pointed out that Russians are great book readers, while the average American doesn't read books. I'll have to look up the statistics on that. Americans do read a lot of magazines—thank heavens. How about you, what's the last book you read?

I just finished Garrison Keillor's *Happy To Be Here*—wonderful book. If you haven't read his *Lake Wobegone Days* you're hurting. *Happy* is mostly reprints of New Yorker stories. What a wonderfully twisted mind Garrison has.

Now I'm reading "Practical Intelligence—working smarter in business and the professions" by Roger Peters. I read two or three books a month—mostly non-fiction—mostly on technology, education and business. No, I'm not average—never said I was—why would I want to be? Where's the benefit?

Speaking of Russian stations, why have you been lying to them every time you work one? You know as well as I that most of their rigs sound terrible, so why haven't you mentioned it? If you ever heard an American with a rig like that you'd let him know fast enough. Take off the kid gloves. Let's try to get them to get their act cleaned up. I think we should push 'em hard to actually talk with us too. I hate being nothing more than a potential QSL card for someone. Keep in mind that the USSR has been able to pour their money into the military—and stay in power—by continuously scaring the devil out of their people about the awful Americans who are threatening to attack them.

Let's see—from Yalta, where it was near 90 degrees, we bussed to Semferopol' and then flew to Leningrad, where it was under 50—where it was still light when we arrived at 12:30 a.m. Another day spent traveling.

Leningrad was shabby. The buildings all look pretty much the same—and all are in various states of poor repair. The clerks in stores and hotels are mostly unhelpful and could care less. Well, they can't be fired, so why make any extra effort or be pleasant? Smile? I don't think there's a Russian word for it.

Typical was Sherry's experience in the hotel book shop in Yalta. They had a nice looking book in English which I thought might be fun to buy. The shop was closed for inventory. Sherry tried the next day and found the clerk was there, but she said she was too tired to handle any sales. She said she'd been up until 10 the night before with the inventory—which wasn't true since the place had been closed and empty all afternoon and evening. Sherry asked when she could buy the book—maybe in a couple of days. This was a tiny shop where counting the books couldn't take more than an hour.

I'm sure the revolution seemed like a good idea back in 1917—it might have worked out great for Russia if they'd gone the democracy route. They had a problem with over 90% illiteracy and a country that was already far behind the industrial revolution.

Things didn't start off too badly, but the Stalin era was murder as he killed tens of millions—doing his best to wipe out the intelligentsia and intentionally starving millions of Ukranians to death. He made Hitler look like a piker.

What they have now is a drab country where no one seems to be happy and where they have to make do with a fraction of the conveniences we take for granted. Interminable lines are a basic part of their day. Cars? Only for a few bureaucrats. It's rare to even see kids laughing and playing.

Snack food? I saw none—no potato chips, no Doritos, no Fritos, not even any pretzels! Boiled potatos I saw. The toughest beef of my life I saw—almost every day on my plate. Cream for my coffee I never saw, occasionally some warm milk. Coffeemate? Ha! No wonder Russians go ape when they see our supermarkets.

I visited a Leningrad department store and found a Sony ICF-4900 9-band radio selling for $365. I had one with me on the trip which I'd bought a few years ago

Continued on page 91

DX

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SVALBARD DXPEDITION

Svalbard is a collection of more than 20 islands that lie as close as 10° to the North Pole, 500 miles north of Norway. Its northern extremity is but 400 miles from the North Pole, but the relatively warm Norwegian current provides a tolerable climate during the summer months.

Spitsbergen is the largest of the islands, about the size of West Virginia. It was first discovered in 1194, and rediscovered in 1596 by the Dutch. During the 18th and 19th centuries, Russians and Scandinavians trapped game in the region, but most development occurred after the discovery of coal there at the end of the 19th century.

The Treaty of Svalbard in 1925 gave Norway sovereignty over the archipelago, but permitted 40 other signatories access to mining and maritime rights. Only Russia took advantage of the terms of the treaty, sending as many as 2,000 coal miners yearly to the region, exporting 300–400 thousand tons each year. The Russians far outnumber the 1,200 Norwegians who inhabit the island year-round.

The climate is better suited to polar bears than people, with winter temperatures ranging from −10° to −40°. Summer temperatures run just above freezing: 40°–45°. The west coast enjoys milder temperatures, thanks to the Norwegian Current, but also suffers more storms. The eastern coast is far calmer and colder. Glaciers crawl down through numerous valleys, especially on the eastern side; many valleys on the western shore are ice-free. The small human population shares the island with a handful of mammals that escaped the years of heavy hunting: seals, walruses, polar bears, reindeer, and foxes. Some birds nest on the island, such as the eider duck (source of the famous down) and some gulls, but only the snowy owl and the ptarmigan stay throughout the long, sunless winter.

The Norwegian population usually includes a handful of amateur radio operators, many of whom use the club station, JW5E, or their Norwegian callsign with JW substituted for LA. Many of these operators use LA5NM as their QSL manager. These hams can be found on the lower bands during the winter months, and on the higher frequencies during the 24-hour-sunlight days of mid-summer. One regular visitor to the island in the summer is Kris Dabrowski SP5EXA. Here, he shares his experiences with 73 readers.

SP5EXA/JW's Summer in Calypsobyen, Spitsbergen

This year I learned that I was going to spend the summer on Spitsbergen only about one week before departure of the expedition, so from then on I spent all my free time on preparations. We left Warsaw on June 9th, and then spent one night in Moscow before we arrived in Longyearbyen, the largest city in Svalbard, via Murmansk, on the northern coast of Russia. On the 12th of June, Russian helicopters took us from Longyearbyen to our summer base about 100 km to the south: Calypsobyen.

This is the second geographical expedition of the University of Maria Curie-Sktodowska in Lublin, Poland. The expedition includes 13 people working in geology, botany, meteorology, etc. We live in one of several old wooden houses built here by English miners over 70 years ago. Last year we cleaned and repaired most of them so this season we found comfortable conditions inside. Weather is rather stable; temperature 0 to 4° C. When we arrived in mid-June, there was still some snow on the ground but it is melting very fast. Polar summer is coming.

I'm the radio operator of the expedition but I also help in some observations. Every 6 hours I measure the ground temperature at various levels about 500 meters away from our base.

I have two licenses. One is professional—LH6X—for contacts with Svalbard Radio (LGS) on channel 3, 1736/2456 kHz, or channel 17, 3645/3217 kHz, and with other groups on Svalbard. I'm in daily contact with the Polish Polar Station in Hornsund on the southern end of Spitsbergen, and with the Norwegian Polar Institute in Longyearbyen. My second license is SP5EXA/JW and I spend most of my free time on the amateur bands. My equipment is a Yaesu FT-757 GX and FC-757 AT antenna tuner. The transmitter is powered by a 165 Amp-hour 12-V battery which I charge every day with a power generator. The old generator is a constant source of trouble because it consumes almost the same amount of oil as the fuel and I'm restricted to use it only 2 hours a day until a helicopter or a ship brings more oil.

My antennas are an inverted vee for 80 meters, dipoles for 40 and 20 meters, and an old TH3JR. All antennas are very low: about 7 meters above the ground and not much more above sea level, due to the complete absence of trees or any other supports. Conditions are good this year and in my first 10 days of operation, I had over 2000 QSOs; EU 75%, JA 20%, USA 10%, and DX 5%. Sometimes I beat European hams in the Pacific direction thanks to one jump less to the North Pole. Mainly I operate CW around 14025 kHz at any time of day. I also like 21025 and 28025 kHz during rare evening openings for short skip to Europe. 7 and 10 MHz are very difficult. 1.8- and 3.5-MHz bands are almost dead thanks to the 24-hour sun. Sometimes I work SSB on 20 meters, but CW is much more efficient with weak signals.

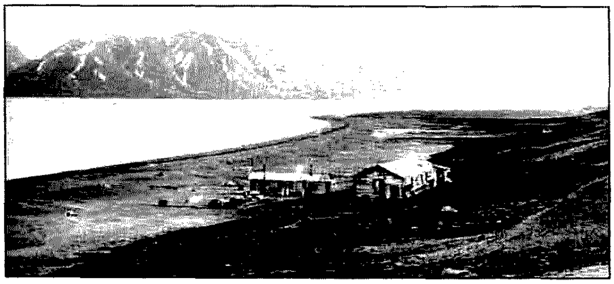
I stay here until the 26th of August and will try to put my antennas a little higher. Unfortunately, I have not enough coaxial cable to put them really high farther than 100m from the house.

That is the story but still I have some more information: Calypsobyen is 77° 33' North and 14° 32' East in the Bellsund Fjord on the west coast of Spitsbergen island about 100km from any other people.

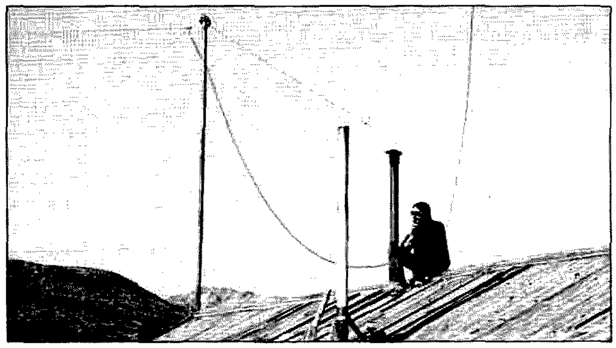
I do not have a QSL manager so please send cards via my home callsign, SP5EXA. [SP5EXA's home address is Kris Dabrowski, ul Senatorska 26 m 4, 00-095 Warszawa, Poland.] I'll also confirm QSOs with JWØEQ, my old callsign from wintering in Hornsund in 1984/85.

I have had to postpone my proposed expedition to Bouvet (3Y) because my family, XYL Regina and two daughters, Agues (10 years old) and Anna (8 years old), are getting upset with my continuous journeys. This is my 4th summer away from home.

By the way, Regina has already got her license, SP5SAD, and if anyone of my friends in Warsaw loans her a rig, I will be able to have daily contact with home. ■



The Geographic Expedition of Marie Curie-Sktodawska University summered in Calypsobyen, on the shores of the Bellsund Fjord on the island of Spitsbergen.



Kris SP5EXA/JW atop his shack, surrounded by some of his dipole antennas.

ABOVE AND BEYOND

Peter H. Putman KT2B
3353 Fieldstone Dr.
Doylestown PA 18901

ES EUPHORIA

As I write this (late July), we are in the midst of one of the more spectacular summer Sporadic-E seasons, with 6 meters having been open almost every other day to most parts of the United States, Canada, Mexico and Caribbean. Two meters has been in equally good condition, with many strong openings from the east coast into the midwest and southwest. Reports have been coming in of tremendous Es openings through the south into the Pacific area as well!

Concurrent with this information is what is possibly the first known 220 Es contact, made between W5HUQ/4 in Jacksonville, Florida (Grid EM90) and K5UGM north of Dallas, Texas (Grid EM12) during the June VHF QSO Party on June 14, 1987. At the time of the contact, there was a very strong opening on 2 meters that was allowing contacts from Florida all the way to Nevada and California for stations in the southwest.

Bill K5UGM tells of several attempts to contact John W5HUQ on 220 after hearing terrifically strong 2 meters signals. It took them 3 times, but as they say—the third time's the charm—and signal reports were exchanged at 15:44 UTC with John's signal hitting peaks of 40-60 dB over S9. At the time, tremendous E clouds were present throughout the southwest and southeast, so tropospheric ducting would seem to be ruled out. Bill also states that Rick K5UR in Arkansas (EM35) made a partial contact with K4DZP in Miami, Florida (EL96).Congratulations are in order for Bill and John! (Thanks to the Midwest VHF Report for this information.)

The June VHF QSO Party featured some truly unbelievable propagation, and subsequent incredible scores! It's entirely possible that all-time records were set during the contest that may never be equalled. Many stations are reporting early scores in excess of 750,000 points (only one station did so last year) and this is largely a result of the 50 MHz openings. Our group, WB2WIK/4, worked 204 grid squares on 6 from Chincoteague Island, Virginia with just a single 7-element yagi and 300 Watts. Other groups are reporting grid totals over 220—simply amazing. I've heard of grid totals on 2 meters in excess of 100 which would also set many records. Imagine working VUCC twice on six meters and once on two meters—all in one weekend!

The great conditions have continued throughout June and July, with strong openings from the east coast into Texas, Arkansas and Missouri again in early July on 2 meters. It goes without saying that 6 meters has been open to most of the 48 states during the same period. Axel N8AXA writes in to tell of a strong opening from Dayton, Ohio (EM79) into Colorado, Kansas, Wyoming and Texas from 2210 UTC on June 29 to 0240, June 30. During this time, Axel worked 33 stations in 17 grids, most of which were new for him. Among the grids worked were DM79, EM18, DM78, DM91, DN70 and DN71.

Which brings us up to the CQ VHF WPX which our group KT2B just finished operating. Conditions weren't nearly as good, but we did have an excellent Es opening on Friday evening to the west coast on 6 meters. This occurred despite an incredible series of problems that had us all but ready to wave a white flag and surrender the 6-meter station to Murphy! Right off the bat we worked into EN61, EN51, DN91, CN84, EL97, and EM29—covering an area from Florida to Oregon with a few states in between.

Conditions were never as good again on 6 the rest of the weekend as far as we were concerned. However, I've received reports via K5UR and others that band conditions on 6 and 2 meters were spectacular all weekend long throughout the south, with double-hop Es from Georgia and the Carolinas to Utah and Nevada. On Friday evening, we did have a strong tropo opening into Ohio, Indiana and Illinois for about 3 hours on 2 meters, mostly yielding contacts along the Great Lakes.

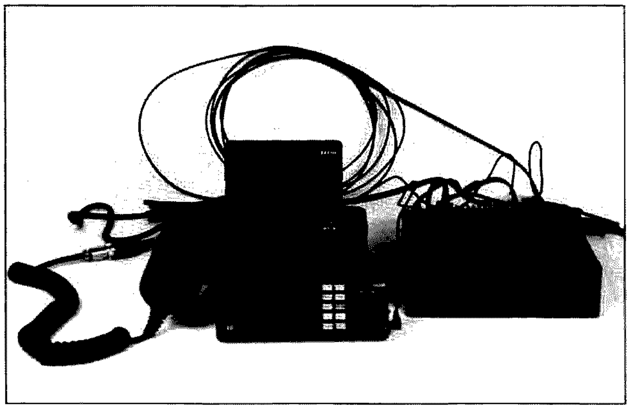


Photo A. The layout of the components of the IC-900 mobile rig. The band units (two black boxes at right) are stowed in an out-of-the-way place, such as the trunk. The interface (below speaker) goes inline between the control panel and the band units.

For the rest of the weekend, we had to content ourself with calling endless CQs and pulling out the contacts one at a time. The only other strong Es opening on 6 meters came late Sunday afternoon when Northern Illinois and Indiana came rumbling in for about 30 minutes. It was fun to listen to John Lindholm W1XX and crew operating 4U1UN from the United Nations building. Boy, did they give a lot of folks on 2 meter FM a thrill! The 4U1UN gang probably copped the Multi-operator/Multitransmitter trophy, as I heard unofficial reports of over 800 QSOs from their operation on 6 bands.

Activity levels were good for the WPX, with an awful lot of stations entering the Portable class. There were some real screwball prefixes on as well, such as NE3, WW4, KF6, etc. Our preliminary totals look like 450 QSOs and 195 prefixes on 6 through 1296. One major problem our group had was that the new UHF antennas for 432, 903 and 1296 didn't go up until Saturday morning—after a strong tropo scatter session on Friday night had run its course. And as I mentioned earlier, we had so much trouble with our 6-meter antenna rotor that we tried in order (1) A new cable (2) A home-brew brake line made from a 100-foot AC extension cord (3) A brakeline made from RG-8/U cable (4) Installing the rotor control box out by the tower and running outside to change it!

Add to this a blown GaAsFET in the first 6 meter transverter and some amplifier relay problems, and you can see why we were ready to call it quits. The only good thing about having the rotor outside is that the swimming pool was located right by it, and the oppressive heat kept us diving in all weekend! One real disappointment was the activity on 220 MHz. We heard only 21 stations on either SSB, CW or FM all weekend long! One has to wonder if hams really want to keep this band. 432 MHz levels were strong, with 46 stations worked—903 yielded 7 contacts and 1296 brought in 16 additional stations. All in all, a reasonably satisfactory contest!

MAILBOX DEPT.: Harry Schools, KA3B has often been called "Six Meters," and not without due cause! Harry is the author of the *North American 50-MHz Directory* (mentioned here a few months back) and is quite active on the band. In fact, Harry reported working about a dozen stations from Great Britain during the CQ VHF WPX at his Delaware contest location, right while we were off the air trying to fix our rotor and GaAsFET problems! It figures. In any event, Harry is presently gathering material on a book about 6 meters which will cover all aspects of operation on the band.

Harry is looking for photographs of station operations, mobile operations, and any pictures of beacon stations and DXpeditions. He is also in need of old 6 meter newsletters, bulletins and other printed material from the past including promotional literature for equipment. If readers have any of this paraphernalia and would like to send it along for possible inclusion, please contact Harry at

1600 South Newkirk Street, Philadelphia PA 19145.

TS-711A Q&A

L. Brian Snyder WA8MZQ writes in from Bellefontaine, Ohio, to make several inquiries about my review of the Kenwood TS-711A in April, *73 Magazine*. He had been active on 2 meters with a vacuum tube transverter, 4CX250B amplifier, FET converter, and home-brew 13 long boom yagi back from 1986 till about 1976. I'll try to answer his questions one at a time:

Q: In the paragraph on the receiver's sensitivity, you mentioned the sensitivity was not on a par with "many of the state-of-the-art transverters." Which transverters are you referring to?

A: I am specifically referring to the Microwave Modules units, including the older MMT144-28 and the newer MMT144-28R. SSB Electronics also makes a unit with similar performance.

Q: In this same paragraph, you mentioned you switched in an external GaAsFET preamp to pull out a weak SSB signal. I am curious whether your preamp was mast-mounted or in the shack?

A: This particular preamp was part of a Microwave Modules MML144-200S power amplifier and was in the shack. I personally have never found the need for a mast-mounted preamp on 2 meters and feel that using lower loss feedline is a more practical improvement—plus it saves a lot of GaAsFET devices from lightning strikes and static discharge!

Q: You recommended using a preamp with this unit, but it shouldn't have any more than 10–12 dB gain. All of the preamps that I have seen have much more gain than this. Which preamps or manufacturers do you suggest?

A: That's true—most preamps on the market do have much more gain than 10–12 dB. What I'm stressing with that number is that dynamic range performance of both the preamp and receiver tend to be degraded with gain figures over 15–16 dB unless an external 50 Ohm pad is employed between the preamp and the receiver—in this case, the TS711A. The Advanced Receiver Research preamps are about the best bet for high performance in this regard as they have a very high third order intercept point.

Q: I am very interested in the system you used to key a linear amplifier. Please send any information you can on this.

A: Nothing fancy here! Either I key the amplifier directly from a multimode transceiver (such as the IC271/275 series radios) or use a sequencer, also made by Advanced Receiver Research. The model is #TRS004VD and it will key up to four external items such as a preamp, relays, amplifier and transverter/transceiver. A foot switch can be used to sequence the whole thing.

A source for the Microwave Modules equipment is The PX Shack, 52 Stonewyck Drive, Belle Mead NJ 08502. ARR products are available from Advanced Receiver Research, PO Box 1242, Burlington CT 06013. Hope this helps!

The recent issue of the EME Newsletter includes information that Gene Shea, KB7Q will no longer be manufacturing the "Q" Products amplifier kits. Too bad, for they represented a great deal for the money! Gene says that time constraints have limited his ability to manufacture these units and is looking for a buyer to clean out his inventory (and customer list!). If interested, contact Gene at 417 Staudaher Street, Bozeman MT 59715 (406) 587-9150.

Up And Coming

I am in the process of reviewing the new IC-900 multiband system with the 2-meter band unit, which has to be one of the strangest looking setups I've ever used. Figure 1 shows what the component parts look like (although I don't recommend setting it up like that!) and after all is done, you've got a 25-Watt FM rig on 2 meters—all for $800. I can hardly see spending that much for one band, but you can completely conceal the various modules in your car and control everything from the small unit in front.

Also coming along is a review of the IC-475A 70-cm multimode, which I've now had a chance to use pretty extensively in the ARRL and CQ VHF contests. It's impressive indeed! ICOM is definitely onto something with these "75" radios as far as performance of the receiver goes. Look for this review next month along with the IC-900 and the ICOM AG35S/AG1200S mast-mounted preamplifiers.

Speaking of which, ICOM was generous enough to donate another IC-1271A for our Chincoteague effort which we also used again during the CQ WPX. As I mentioned in my review last year, the 1271A really needs some sort of preamp in front of it, and the AG1200S makes all the difference in the world. It's neat having a complete 23 cm station all by itself in one package. One drawback: The AG1200S is only rated for 15 Watts maximum power capacity in a mast-mounted application! In my case, that meant running the preamp right behind the 1271A and before the outboard 23 cm cavity amplifier (elsewhere in this issue). The feedline used on Chincoteague was 9913; however, we employed two stacked 55-element yagis which had more than enough gain to overcome the losses of the feedline. One useful accessory I whipped up was a box with two RCA jacks on it and a 24-pin MOLEX plug. This connected to the +13.8 VDC line and the keying line from pin 8 of the 1271A connector. These two lines were used to provide a PTT closure to ground (to activate bias for the amplifier) and 13.8 VDC for the coaxial relay on the external amplifier. Very handy!

I also had to make similar cables up for the IC-275A and IC-475A we used. Surprise! No more 24-pin MOLEX connectors! ICOM has now gone to an 8-pin DIN connector, same as that used on the Kenwood TS-520/530/430/440/930/940 radios! This connection allows keying of the amplifier through pin 3 of the DIN plug, and our external Microwave Modules and Tokyo Hy-Power linears keyed with no problems for the duration of both events.

With the external amplifier and preamp, the 1271A is probably worth the money if you are seriously interested in 23 cm work. Consider that the only comparable 23 cm product (the SSB Electronics LT23S transverter) will set you back over $600, and the 1271A begins to look attractive. Of course, you don't have to use the AG1200S and in fact might be better off installing your own preamp inside the radio permanently. There's plenty of room for it! Both SSB and Microwave Components of Michigan make excellent 23 cm GaAsFET preamps for about $100 or so.

Well, that's it for this month; see you the next. Above and Beyond! ■

AERIAL VIEW

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Do you build your own antennas? Or are you like the ham I recently overheard on one of the local repeaters who said that the only antenna he had ever erected was the rubber duck on his HT? If that could have been you, let me assure you that it is easy to build simple, yet efficient, wire antennas and have fun doing it. Besides that, you'll save money—and who doesn't want to do that?

What appears to be number one in the simplicity department is the endfed wire (Fig. 1). After all, what could be more simple than attaching one end to the output jack of your transmitter and securing the opposite end to the top of the highest object available? That sounds great in theory, and they can work well in practice, but there are some problems that can arise with random length endfed wires.

Problems? What sort of problems? First of all, the impedance your transmitter "sees" will vary with the length of the wire. If the wire is 1/4-wavelength or a multiple thereof, in length it will have a low impedance at the transmitter, perhaps close enough to 50 Ohms to make your transmitter "happy."

The odds are, however, that you will need some sort of matching device if your transmitter is going to put out full power (many modern transceivers reduce power output in the face of an swr of greater than 2:1). If the antenna is 1/2-wavelength long or some multiple of that length, it will present a high impedance at the transmitter and you will definitely need an external matching device.

Another problem that can arise with the endfed wire is "rf in the shack." You'll know that you have this problem when your rig begins operating erratically and you get zapped if you come into contact with your equipment when the transmitter is keyed. (Talk too close to the mike and you'll get it in the lips.) Proper grounding can cure this problem, but you also can avoid it entirely by using an antenna with low impedance feed, such as a centerfed dipole.

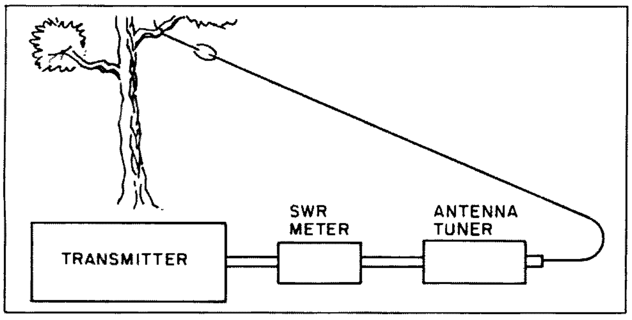
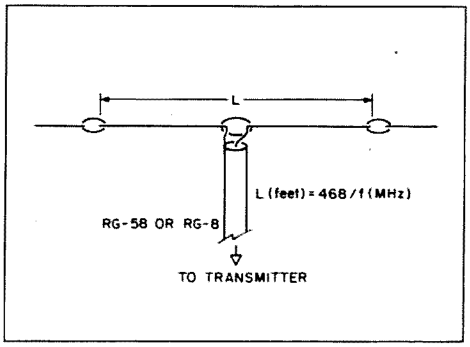
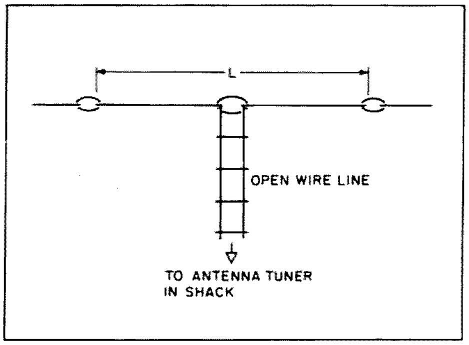


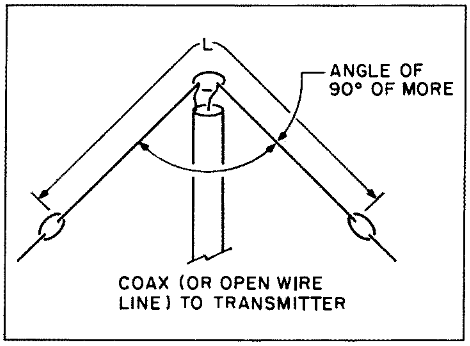
Fig. 1. Endfed wire with swr meter and antenna tuner installed for matching purposes.



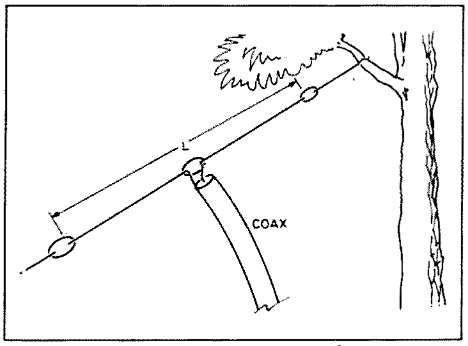
(a) A coax-fed dipole. RG-58 is suitable for moderate runs at the lower frequencies. Use RG-8 for long transmission lines, especially at 10 meters.



(b) Dipole fed with open-wire line. An antenna tuner is needed between this transmission line and the transmitter.



(c) Inverted vee. The length at resonance will be approximately 468/f, but will vary with the angle of the vee.



(d)Sloper. As with all of these antennas, try to bring the feedline off at right angles from the antenna.

Fig. 2. A variety of dipole antennas.

When it comes to combining performance and simplicity, it's hard to beat the 1/2-wavelength centerfed dipole. You can feed it directly with coax, if you're interested in operating on a single band, or use open-wire line and a tuner to put the antenna to use on a number of bands (Figs. 2.(a) and 2.(b)). The dipole can be supported from its ends, from its center, thereby forming an inverted vee (Fig. 2 c), or from one end, producing a sloper—Fig. 2.(d). You probably learned that the impedance of a resonant half-wave dipole is 70 Ohms and that the antenna does not radiate off its ends, but when mounted relatively close to the ground the radiation pattern assumes a more omnidirectional shape, and the impedance is typically in the vicinty of 50 Ohms. The latter fact allows us to feed the dipole with common RG-58 or RG-8 coax. A 1:1 balun may be inserted at the antenna feedpoint in this case if you so desire, but you can obtain equal and perhaps superior results without a balun.

A third simple wire antenna is the full-wave loop (Fig. 3). It may be erected in the shape of a square, rectangle, or triangle. Due to space limitations, this antenna is more commonly used on 7 MHz and higher frequencies, where the size of the loop becomes more manageable. To match the impedance of the resonant loop to that of RG-58 or RG-8 coax, it is necessay to insert a 1/4-wave transformer formed from 75-Ohm coax (RG-59, for example); see Fig. 3. At right angles to the loop this antenna theoretically has a gain of about 2 dB over a dipole, but if mounted close to the ground (in terms of wavelength) I doubt that the full 2 dB will be realized.

Perhaps you would like to put up a dipole on 80 but, living on a small city lot, feel there isn't sufficient room. Well, there are ways around that. If necessary, you can bend the ends of the dipole to conform to the available space. Another solution is to use a shorter antenna. After all, a dipole does not necessarily have to be 1/2-wavelength long. The efficiency of, say, a 75-foot dipole on 80 meters will be only slightly less than that of a full-sized antenna. To use such an antenna, however, you will need to feed it with open-wire

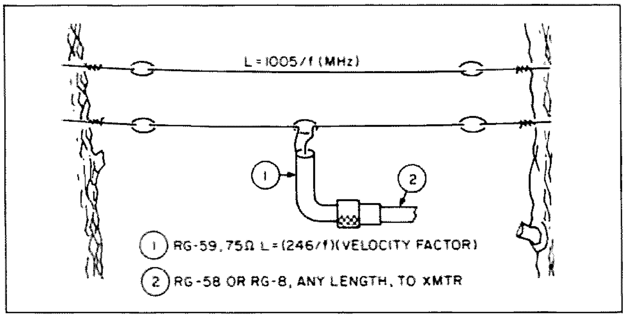


Fig. 3. Full-wave loop. The length of the 75-Ohm matching section is given by the formula above. The velocity factor varies with the type of coax. It is 0.66 for solid dielectric and 0.8 for the foam type.

line with a transmitter to provide a match to your rig's 50-Ohm output. As was mentioned earlier, this antenna could be used on all the HF bands.

Worried that you can't get that antenna more than 15 feet above the ground? Well, it's generally true that the higher the antenna the better your results will be, but that doesn't mean that an antenna in close proximity to the ground won't work at all. You may not be the strongest signal on the band, but you will still be able to make contacts. Do take care, however, to keep your antenna out of reach of passers-by to avoid possible rf burns.

"Okay [you say], you've convinced me. But what kind of wire should I use, and what do I do for insulators?" Any of the antennas described here can be built of solid or stranded wire, insulated or bare. The National Electric Code states that all antennas should be constructed of at least No. 14 wire, but it is fair to say that most hams use whatever is handy, so long as it will support itself. As for insulators, you can buy them or make your own. Suitable materials include Plexiglas™ and a variety of plastic materials. Parachute cord or similar light rope is good for supporting the ends of your antenna: be aware that plastic-type ropes disintegrate in a relatively short time when exposed to sunlight.

When feeding an antenna with coax, I like to use a small piece of Plexiglas as a center insulator, with a female coax connector (SO-239) mounted right on the Plexiglas (fig. 4). This makes it a simple matter to connect your feedline or to remove it later, if necessary. Be sure to waterproof the connection with Coax-Seal or a similar product to keep water from invading the line and ruining the coax.

If you want to use open-wire feedline, you will probably have to construct your own, but that is not a difficult task. Once again, small strips of Plexiglas are suitable for insulators. You can also use things like hair curlers, or other household items that are nonconductors. Their length is not critical, but try to keep the spacing of the wires relatively constant (3 to 6 inches). Try to keep this line at least 6 inches away from other wires or surfaces. It can be somewhat awkward to bring such a line into the shack. One way to do so is to secure the end of the line near the shack, and run a short length of 300-Ohm twinlead between your tuner and the main transmission line. This will probably result in an swr "bump" on the transmission line, but since the line is a low loss type this should create no problems. Any reflected power will be re-reflected by the antenna tuner, travel back up the transmission line, and be radiated by the antenna.

As I mentioned earlier, a dipole fed with open-wire line may be used on several bands with the aid of a tuner. If you want to avoid the hassle of open-wire line and an antenna tuner, but want to operate on more than one band, there are a couple of options available to you. One is to make separate dipoles with separate transmission lines for each band. Or you can use one coax feedline with the dipoles connected in parallel (Fig. 5). Using the latter method will probably result in a narrower bandwidth between 2:1 swr points, but it will allow you to get on two or more bands with a single coax feedline.

So there you have some simple wire antennas that are not difficult to build, and provide good performance. Why not give one a try?■

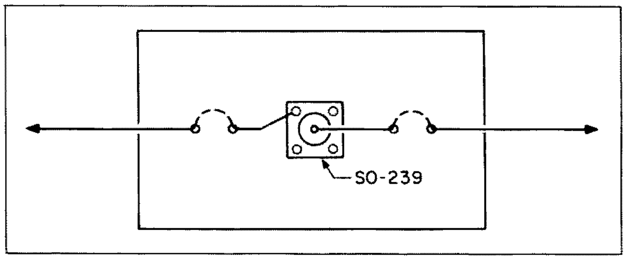


Fig. 4. Center insulator for dipole constructed from Plexiglastm sheet and female coax connector. The antenna wires are woven through holes in the Plexiglas to relieve strain on the SO-239 connections.

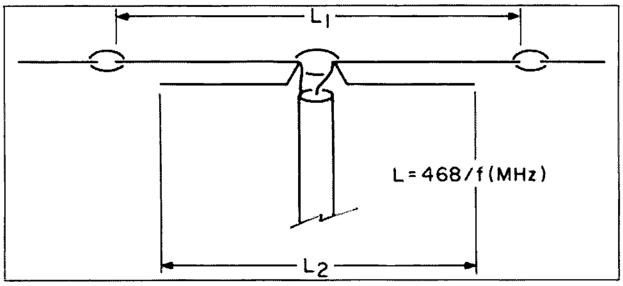


Fig. 5. Parallel dipoles. The dipoles are initially cut to length using the formula shown, then trimmed to achieve resonance. There is some interaction between the two dipoles, so recheck the resonance points after trimming the second dipole.

ATV

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CONSTITUTIONAL COMMENTS

In my recent columns I have spoken much about the need for the official formation of clubs or organized ATV Groups to accomplish and finance a difficult task: To get an ATV repeater and/or remote transmitter on the air and operating. It is certainly a difficult task for one or two devoted individuals to complete but many systems have been built up just that way—without much help at the beginning. You have to do what must be done to get ATV activity going in your local area. Hopefully, you'll have some friends to help share the load. ATV clubs have the mode to keep interest alive and everyone together!

I spoke also about the importance of a good, well-written club constitution and its by-laws that specializes in the fast- scan TV mode of operation. More general club constitutions are fine for regular amateur radio clubs but some specific changes are required for specialized groups.

I would be happy to send a 4-page copy of our local group's constitution and by-laws for an SASE. It might be an invaluable aid in setting up your own legislation document. We got our example copy from the Southern California ATV Group.

DTMF Circuits

In our area, we have N9CAI ATV/R, perhaps the most complicated FSTV UHF 10-channel ATV remote transmitter in the country. This is now linked via 910.25 MHz (WBØBIZ ATV/R) for ten additional channels—totalling 20 viewable TV video source feeds. The new linked TV channel feeds are for:*color weather radar* at 60-, 120-, 180-, and 240-mile scans; the GOES EAST/WEST Satellites; an outdoor 200-foot, weatherproofed, rotatable, pan and tilt, color CCD tower camera overlooking the Quad-City Mississippi River Valley; a wall- mounted color NBC studio camera that lets us see pre-setup and takedown of live local channel 6 newscasts; a satellite A-NEWS feed; various internal studio-to-on-site area engineering microwave TV feeds; an auxiliary ATV #2 receiver on 439.25 MHz.; a computerized spectrum analyzer program display interfaced to 2m FM; a packet radio digipeater video window feed; and a local NBC off-air tap. There are a couple of other expansion channels to be used for future uses.

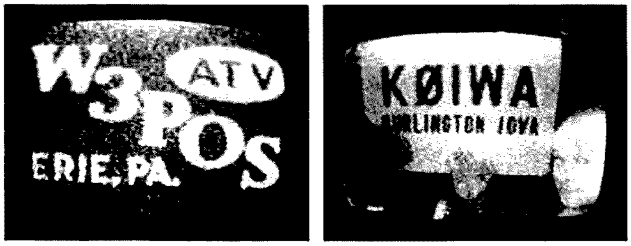
The above part of our system was built by WBØBIZ. The majority of use of our local ATV system is in what we call Mode-A; the remote transmit (RT) position. There are few RT systems across the country, but interest is growing and we are beginning to see more additions of the above-mentioned touchtone™ select capability feature to ATV repeater systems. There are 17 such systems known in the country. They are really much simpler to construct compared to the effort required to make an inband wideband video repeater work.

Surprisingly, the heart of any ATV RT lies in a non-video module: the touchtone™ decoder circuit. This circuit controls the on/off keying of the fast scan TV transmitter and does the switching for all the video source feeds. You can build or buy these devices. Radio Shack has a nifty SS120P IC DTMF decoder (Cat. #276-1303) for $8. Figure 1 is a simple circuit, like the one provided by John Hegeman WBØBIZ of Davenport (our 910-MHz link T.T. control system). A number of other similar DTMF designs have been in nearly all electronics journals.

Other more multi-functioned DTMF circuits popular for the radio hobbyist are ones from Advanced Computer Controls, Inc.[1] Their ITC-32 model has 28 outputs, onboard sense alarms, and command acknowledgments done in CW. This unit runs about $275. Connect Systems, Inc.[2] has a neat model; the CS-16 ($164), with 16 functions and two passwords. These and other more expensive DTMF circuits are designed more for the elaborate controlling of voice repeater systems rather than the simple switching of video source feeds for ATV. If you want to turn on/off only one video source, such as a computerized bulletin board, weather radar, or camera, investigate the Engineering Consulting[3] model TSD kit, a 4-digit DTMF for just $23 ($60 assembled). Yes, you can order and add on extra latches for just $9 each!

The *Spec-Com Journal*[4] (September/October 1986) published a construction article by WA8HEB on a MOSTEK MK5102 decoder that uses a S3525A filter (contact WBØESF and include $2.50 for the issue). Just browsing through the amateur radio journals, one can find all kinds of DTMF decoder circuits to fit the needs of an ATV building project. Also keep in mind, that such a project can be done at home station as well as out on an ATV/R site. Hmmm... the possibilities!

The built-up and interfaced decoder circuit has the purpose to switch the video sources. These



W3POS and K0/IWA set new FSTV DX land record of 570 miles. (Photos by WB8ELK)

75-Ohm (hopefully terminated on all unused ports) video feeds do not hook up directly to the DTMF board. You must have a switching video channel sequencer or selector. These can be found at any hamfest and/or broadcast TV station. Most are rack-mounted, although some are housed in small boxed compartments with the inside mechanical DC voltage relays with BNC, RCA, or S0-239 female connectors. The mechanical video selector box or panel must work in unison with the DTMF decorder. John Gebuhr WBØCMC of the Omaha Nebraska ATV group has some well-drawn plans for making up such a device. In fact, at Dayton he asked me if I thought there would be any interest or market for a rack-mounted panel with switches, connectors, and even a touchtone™ circuit. Contact John by mail and twist his arm a little, and I'll bet he'll come through for you non-builders. Hap Griffin WA4UMU or Gerald Cromer K4NHN of Cayce, South Carolina might also have some suggestions. Once these two devices are procured and interfaced, you need only hook up a transmitter and video source feeds.

What ATV Transmitter to Buy?

I recommend either the PC Electronics (see ad in *73*) KPA5 (70cm at $159) or KPA-33 (900 MHz) 1-Watt exciter, or their TXA5 and 10-Watt PA systems. For a catalog of their fine ATV products, write to them directly at 2522 S. Paxson, Arcadia CA 91006. Wyman Research (RR #1, PO Box 95, Waldron IN 46182) also has some neat little 1-Watt exciters and 10-Watt systems for about the same price. Also available is the PC KPA5 pre-assembled circuit board housed in an rf-proof Hammond Box with power, input, and output connectors used on the Chicago 1-Watt KB9FO ATV remote transmitter system at the Merchandise Mart. It can't get much simpler! Low-power 1-Watt transmitters can be power-boosted to 10, 20, or 50 Watts by Alicon or Mirage amplifiers. The touchtone™ decoder can also select high or low power levels as desired by the user operator.

All incoming video sources should have their varying composite video, colorburst, and sync levels passed through what are called video distribution amplifiers. These amps assure uniform TV signals. Don't let not having one of these amps hold you up from getting on the air. However, varying sources are not critical, and many sources can be adjusted internally for quite acceptable pictures. Hap Griffin WA4UMU offers Proc-Amps and distribution amplifier kits for ATVers.

What kind of TV video channel feeds can you put on such a system? We have talked about this before in previous columns so I will just reiterate the list: computer bulletin boards, NTSC color bars, live cameras, radio station disk jockeys, ATV/R windows, SSTV converters, commercial gameboards, VCR players, weather radar and other satellite feeds, spectrum analyzers, video-modified scopes, packet, Fax, RTTY, and Morse converters. In short, whatever is video can be used as a viewable source! The only thing to be careful of is to ensure that

each feed serves a useful purpose. For an elaborate RT block diagram of a system, including linked sources, send me an SASE referring to this subject.

In Praise of Remote Transmitters

ATV remote controlled transmitters are catching on. They provide an alternative mode selector to an ATV repeater system. This gives a closed access capability to a system. (This is a good way to ensure membership dues payment!) Here in SE Iowa, Mode-A our remote transmitter, gets used much more than our Mode-B FSTV repeater. There is no need to be alarmed about deteriorating live video viewing. After our RT was activated, over 25 members joined our BRATS ATV Club and eventually got on two-way FSTV, due largely to the neat things being shown at night on Mode-A! Remote transmitters can be a real boost for UHF Ham-TV activity! Standards have to be established on how to properly access, run, and shut down the system.

Nearly all in our group FCC ID before and after accessing the system, or it gets shut down on them quickly. Dues are kept up to date since no one wants to lose the touchtone™ control operating privileges. On ATV, once you get hooked, it's hard to back out! ATV remote transmitters quickly become your reliable friend out there. They are always there to serve and entertain you. Now go out there and build one! If you do, register it with the USATVS. 73s de Mike WB0QCD See you on the tube next month . . . ■

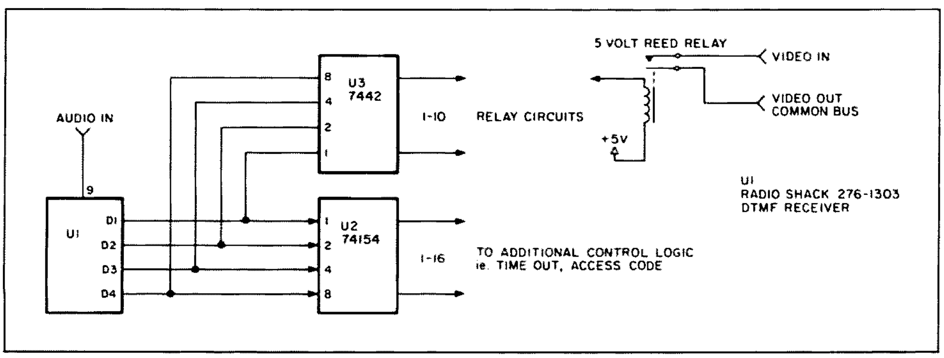


Fig. 1.

References

1. Advance Computer Controls, Inc., 2356 Walsh Ave., Santa Clara CA 95051.
2. Connect Systems, Inc., 23731 Madison Street, Torrance CA 90505.
3. Engineering Consulting, 583 Candlewood Street, Brea CA 92621.
4. Ralph Wilson WB0ESF, Copy Service, 4011 Clearview Drive, Waterloo IA 50613.

RTTY LOOP

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OK, Okay, OKAY! I hear you all clamoring to get your two-cents' worth into the column after my monopolization for the last few months. Just cool your jets, and I'll try to take you one at a time!

Just to whet your appetites, folks, the topics we will cover this month should range from antique to modern, with just about everything in between. Let's dig into the mail pouch and see what we find.

Art Simpler K4LJX, from Lake City, Florida, writes: "down here in the south, it is impossible to get parts for my transmitter, such as mica condensers. I have a WRL (that's World Radio Labs to you youngsters) 500-Watter and have need for parts from time to time, and I'm wondering if there's an electronics store that may have the above."

Well, Art, I remember WRL—used to have a catalog with their equipment when I started in this hobby almost a quarter of a century ago (I was an infant... ha!). Other than the few old caps I have in the junque box, I know of no current source for such parts. Anybody lend a hand? Such information is always useful, what with old transmitters and receivers changing hands at hamfests and club swapmeets. Pass the details along, and I'll try to circulate it here for all to benefit.

Jumping over to the RTTY1-1 program a bit, that is the one featured in the July issue of this column, for the Radio Shack Color Computer®, Raymond Cervantes III of Garland, Texas, wonders about using this program with tape, and whether or not there are any hidden commands. Well, Raymond, if there are any hidden commands, they are hidden well enough that I don't know about them. Although the program is set up to load from disk, it does support tape saves and loads of data, and in this way supports tape. It does not, to my knowledge, run directly on a tape-based (only) CoCo, as it accesses various subroutines in the disk ROM. Now, someone may have it running on a tape-only machine, and if I hear about that, I'll pass it on. In the meantime, though, I'd say this may not be the best choice for a tape-only system. There is more in the wings, though, so keep reading the column this winter!

More Mail

Not all my mail is complimentary, folks. Here's a letter from Larry Morgan, K7LX of College Place, Washington, that takes issue with the review of the AEA PK-232. Larry writes:

"I am saddened and upset to see a whole column, nearly two magazine pages, devoted to a recitation of the AEA PK-232 features—written much like advertising copy...

"It is bad enough that equipment reviews are often written in this manner, but I would hope the news columns could be written in a more straightforward and balanced manner. For instance, nowhere in this column do you mention a fact about the PK-232 that should be of major interest to anyone operating RTTY: the 200- (rather than 170-) Hz shift is employed both on transmit and receive.

"The great majority of the information in this column could and should be obtained by interested persons from the manufacturer, not from a magazine news column.

"And, incidentally, you mention lack of expressed interest in AMTOR for your lack of coverage in your column. May I suggest a clearer indication of interest might be gained by listening on the air? Try tuning 14070 to 14080 any time 20 meters is open and you will find plenty of activity.

"Your column does not make clear if you actually *own* a PK-232, but if you do you might be interested in a PK-232 characteristic I discovered while operating the unit for several months on AMTOR: When in ARQ AMTOR QSO with a station with a better than average signal, the PK-232 was showing numerous errors on both ends of the circuit (that is, repeat requests) and very slow throughput. After about 40 minutes of this, the other station mentioned in pass-

RADIOFACSIMILE SCHEDULE

CFH	HALIFAX NS, CANADA	4271, 6330, 10536, 13510
GXH	THURSO, SCOTLAND	3731, 8080, 12865
NAM	NORFOLK VA, USA	3357, 8080, 12865
WLO	MOBILE AL, USA	6850, 9157.5, 11145
NMF	BOSTON MASS, USA	3242, 3242.5
WFH/WFK	BRENTWOOD NY, USA	9290, 9389.5, 11035
	HONOLULU HI, USA	9982.5, 11090, 16135, 23331.5
NMC	S.F. CA, USA	4346, 8682, 12730, 17151.2
CKN	ESQUIMALT B.C.,CAN.	4268, 6946, 12125
NOJ	KODIAK AK, USA	4298, 8459
NPM	PEARL HARBOR HI, USA	2122, 4855, 8494, 9396, 14826, 21837
WWD	LA JOLLA CA, USA	8644.1, 17408.6

North Atlantic Ocean

TIME (Z)	AREA	SOURCE
0000	WESTERN NORTH ATLANTIC (ICE INFO)	CFH
0115	NORTH ATLANTIC OCEAN(SCHEDULE)	NAM
0115	WESTERN MED/EASTERN ATLANTIC (SCHED)	GXH
0250	GULF OF MEX (ANALYSIS)	WLO
0300	GULF OF MEX (WIND AND WEATHER ANALYSIS)	WLO
0310	GULF OF MEX (FORECST)	WLO
0316	WEST. NOR. ATLANTIC (ANALYSIS)	CFH
0416	W. NOR. ATL. (WAVE ANALYSIS & PROGNOSIS)	CFH
0500	WEST. NOR. ATLANTIC (ANALYSIS)	CFH
0520	W. NOR. ATL. (36 HR SURFACE PROGNOSIS)	CFH
0530	NEW ENGLAND WATERS (ANALYSIS)	NMF
0540	NEW ENG. WAT. (12 HR SURFACE PROGNOSIS)	NMF
0550	NEW ENG. WAT. (36 HR SURFACE PROGNOSIS)	NMF
0600	NEW ENG. WAT. (SURFACE PROGNOSIS)	NMF
0600	WEST. NOR. ATLANTIC (SURFACE PROGNOSIS)	CFH
0616	W. N. ATLANTIC (24/36 HR WAVE PROGNOSIS)	CFH
0700	W. N. ATLANTIC (ANALYSIS)	CFH
0708	W. N. ATLANTIC (NEPHANALYSIS)	CFH
0750	W. N. ATLANTIC (ANALYSIS)	WF/WFK
0800	W. N. ATL. (SEA SURF. TEMP. ANALYSIS)	CFH
0850	GULF OF MEXICO (ANALYSIS)	WLO

North Pacific East

0001	40 N,25 S; 110 W, 160 E	KVM70
0015	SAME (ANALYSIS)	KVM70
0030	SAME	KVM70
0046	SAME (NEPHANALYSIS)	KVM70
0100	20 S-30 N,EAST OF 160 W (SURFACE PROGNOSIS)	NMC
0100	40 N,EQUATOR;110W;160E (WAVE PROGNOSIS)	KVM70
0103	30N-60N,EAST OF 160E (SEA SURF. PROGN.)	NMC
0113	SAME AS ABOVE	NMC
0123	SAME (EXPERIMENTAL)	NMC
0300	63N,179E,37N,160W,34N,118W,55N,92W (TEST CHART)	CKN
0300	30N-60N, EAST OF 160E	NMC
0303	40N-52N,EAST OF 135W (SEA SURFACE TEMP ANALYSIS)	NMC
0310	SCHEDULE	CKN
0313	28N-40N,EAST OF 136W (SEA SURF. TEMP ANALYSIS)	NMC
0325	46N,177W,28N,157W,37N,122W,83N,121W (ANALYSIS)	CKN
0333	28N-40N,EAST OF 136W (SEA SURF TEMP ANALYSIS)	NMC
0335	59N,155W,35N,140W,37N,122W,63N,121W	CKN
0340	63N,179E,37N,160W,34N,118W,55N,92W (ANALYSIS)	CKN
0500	GULF OF ALASKA AND BERING SEA	NOJ
0500	30N-60N,EAST OF 160E	NMC
0503	SAME (ANALYSIS)	NMC
0513	SAME	NMC
0523	SAME (EXPERIMENTAL)	NMC
0540	TEST CHART	KVM70
0547	30N,50S,90W,180	KVM70
0601	40N,25S,110W,160E	KVM70
0615	SAME (ANALYSIS)	KVM70
0630	SAME	KVM70
0646	SAME (NEPHANALYSIS)	KVM70
1000	GULF OF ALASKA AND BERING SEA	NOJ
1105	TEST CHART	KVM70
1117	30N,50S,90W,180 (ANALYSIS)	KVM70
1131	40N,25S,110W,160E (ANALYSIS)	KVM70
1145	40N,25S,110W,160E	KVM70
1200	SAME	KVM70
1200	SCHEDULE (60N-05N,123W-161W)	NPM
1214	SCHEDULE (60N-05N, 165E-101W)	NPM
1216	40N,25S,110W,160E (NEPHANALYSIS)	KVM70
1228	60N-05N,123E-161W (24 HR SURFACE PROGNOSIS)	NPM
1230	40N, EQUATOR; 110W; 160E	KVM70
1242	60N-05N, 165W-101W (SCHEDULE)	NPM
1256	60N-05N,123E-161W (24 HR SURFACE PROGNOSIS)	NPM
1310	60N-05N,165W-101W (24 HR SURFACE PROGNOSIS)	NPM
1324	SAME AS 1256Z	NPM
1338	SAME AS 1310Z	NPM
1352	SAME AS 1256Z	NPM
1406	SAME AS 1310Z	NPM
1420	SAME AS 1256Z	NPM

1434	SAME AS 1310Z	NPM
1448	SAME AS 1256Z(48 HOUR)	NPM
1500	40N-52N, EAST OF 135W (SEA SURF. TEMP ANALYSIS)	NMC
1500	TEST CHART	CKN
1502	SAME AS 1310Z(48 HOUR)	NPM
1503	30N-60N, EAST OF 160E (MEAN MIXED LAYER DEPTH ANALYSIS)	NMC
1510	63N,179E,37N,160W,34N,118W,55N,092W (SURFACE PROGNOSIS)	CKN
1513	28N-40N, EAST OF 136W (EXPERIMENTAL)	NMC
1516	60N-05N, 123E-161W (48 HOUR ANALYSIS)	NPM
1523	30N-60N, EAST OF 160E (EXPERIMENTAL)	NMC
1525	SAME AS 1510Z	CKN
1530	SAME AS 1310Z (48 HOUR	NPM
1530	SAME AS 1510Z (12 HOUR)	CKN
1540	SAME AS 0325Z (WAVE PROGNOSIS)	CKN
1544	SAME AS 1256Z	NPM
1550	SAME AS 1540Z	CKN
1600	SAME AS 1530Z (ANALYSIS)	CKN
1608	NORTH PACIFIC OCEAN	NPM
1615	SAME AS 1550Z (SEA SURF TEMP ANALYSIS)	CKN
1627	NORTH PACIFIC OCEAN	NPM
1644	NORTH PACIFIC OCEAN	NPM
1648	SAME AS 1544Z (72 HOUR)	NPM
1700	20S, 30N; EAST OF 160W (ANALYSIS)	WWD
1702	60N-05N,165W-101W (72 HR SURFACE PROGNOSIS)	NPM
1715	20S-30N,EAST OF 160W (SEA SURF TEMP ANALYSIS)	NMC
1716	58N-10N,177W-110W (ANALYSIS)	NPM
1718	SAME AS 1700Z	NMC
1728	30N-60N, EAST OF 160E (12 HR ANALYSIS)	NMC
1738	20S-30N, EAST OF 160W	NMC
1738	58N-05N,120E-173W (ANALYSIS)	NPM
1755	TEST CHART	KVM70
1802	30N,50S;90W;180	KVM70
1814	NORTH PACIFIC OCEAN (WARNINGS)	NPM
1816	40N, 25S; 110W, 160E (ANALYSIS)	KVM70
1830		KVM70
1830	60N-05N, 123E-161W (SEA SURF TEMP ANALYSIS)	NPM
1844	60N-05N, 165W-101W (SEA SURF TEMP ANALYSIS)	NPM
1846	60N, 10S; 115W, 160E (ANALYSIS)	KVM70
1858	60N-05N, 123E-161W (12 HR SURFACE PROGNOSIS)	NPM
1900	EXPERIMENTAL	WWD
1900	GULF OF ALASKA AND BERING SEA	NOJ
1900	60N-10S, 115W-155E (ANALYSIS)	KVM70
1903	40N, 25S; 110W, 160E (NEPHANALYSIS)	KVM70
1912	60N- 05N, 165W- 101W (12 HR SURFACE PROGNOSIS)	NPM
1917	60N, 34S; 110W, 98E (SEA SURF TEMP ANALYSIS)	KVM70
1926	60N-05N, 123E-161W (12 HR SURFACE PROGNOSIS)	NPM
1940	SAME AS 1912Z	NPM
1954	60N- 10N, 160E- 90W (ANALYSIS)	NPM
2000	20S -30N, EAST OF 160W	NMC
2003	SAME AREA (SCHEDULE)	NMC
2013	30N-60N, EAST OF 160E	NMC
2019	SAME AS 1926Z (36 HOUR)	NPM
2023	SAME AS 2013Z	NMC
2033	SAME AS 1940Z (36 HOUR)	NPM
2047	SAME AS 2019Z (12 HOUR)	NPM
2100	TEST CHART	CKN
2101	SAME AS 1912Z	NPM
2110	SAME AS 1530Z	CKN
2115	60N-05N, 123E-161W (ANALYSIS)	NPM
2125	SAME AS 2110Z	CKN
2129	SAME AS 2101Z (36 HOUR)	NPM
2140	SAME AS 2125Z (ANALYSIS)	CKN
2143	60N-05N, 165W-101W (ANALYSIS)(36 HOURS)	NPM
2150	SAME AS 2140Z	CKN
2157	SAME AS 1926Z (36 HOUR)	NPM
2200	GULF OF ALASKA AND BERING SEA	NOJ
2205	59N,155W,35N,140W,37N,122W,63N,121W(WTHR DEPIC.PROG.)	CKN
2210	46N,177W,28N,157W,37N,122W,63N,121W (WAVE PROGNOSIS)	CKN
2211	60N-13S,115E-105W (24 HR SURFACE PROGNOSIS)	NPM
2220	SAME AS 2210Z	CKN
2234	SAME AS 2157Z	NPM
2248	SAME AS 2101Z (26 HOURS)	NPM
2300	20S,30N, EAST OF 160W (ANALYSIS)	WWD
2302	58N-10N,177W-110W (ANALYSIS)	NPM
2315	25S-40N,160E-110W (TEST CHART)	KVM70
2324	58N-05N,120E-173W (ANALYSIS)	NPM
2330	20S-30N,EAST OF 160W	NMC
2333	SAME	NMC
2335	TEST CHART	KVM70
2343	30N-60N,EAST OF 160E (18 HR ANALYSIS)	NMC
2346	NORTH PACIFIC OCEAN	NPM
2347	30N, 50S; 90W; 180	KVM70
2347	SCHEDULE	KVM70
2353	EXPERIMENTAL	NMC

ing that ANOTHER party he talked to regularly that used a PK-232, found under similar conditions that resetting the PK-232 by turning it off and back on again would often clear up the circuit. I tried that right while we were talking and immediately the throughput jumped up to near 100 percent, as befitted the good signals we had. After repeating this experience several times I just developed the habit of resetting the PK-232 (by turning it off and right back on) every few minutes. I can only assume this is a software problem that takes some particular unknown set of circumstances to manifest itself. It is really insidious since the unit doesn't stop working completely, which you would of course notice immediately. It just slows down the throughput more than it should."

Larry, you raise several points, which is why I am printing essentially your entire letter. To begin with, the August column was written by me, not by AEA or some advertising copywriter. If you don't like my choice of words, I'm sorry, but we all choose the form in which we would like to get a message across.

A few years ago I devoted a column to AMTOR, going over the basic techniques and differentiating some of the modes. I even printed a bit of correspondence with Peter Martinez G3PLX, whose introduction to AMTOR in the PK-232 manual I specifically highlighted. The fact is, that until this piece on the PK-232, I averaged less than one letter a *year* on AMTOR. Thus my statement of no interest. If this article, and others like it, lead to more coverage of this mode, it will be my pleasure to be there with material.

Yes, I do own a PK-232, and within the limits of use I put it to I was quite impressed. The problem you describe is interesting for two reasons: to circulate, so that other owners of PK-232s can look at their own situation and report their findings; and to report to AEA so that, if it still exists in the latest ROM, it can be fixed. For your information, as well as other PK-232 owners, the ROM release I have, 04.MAR.87, is, I believe, the latest one. This is the ROM that includes FAX and SIAM modes.

I will report back to you what AEA has to say. I really do thank you, Larry, for your letter. It is only through interested readers like yourself that I can keep a sense of what all want to see here in RTTY Loop.

Helpful Hints

Howard S. Bacon of South Pittsburg, Tennessee, is a CoCo nut who must have read one of last month's books because he relates that he is working on his Digital Novice. Good luck, and keep reading for more along the same and other lines!

One fellow looking for help is E. Oskar Schreiber, M.D. KE5ZV, of Harlingen, Texas, who is running a TRS-80® Model III on RTTY. Although he, too, is using a PK-232 interface, he is looking in vain for a good terminal program. Well, Oskar, a few years back there was a program for the TRS-80 Models I, III, and IV, put out by KCQ Software, about which I received many favorable comments. You might drop a note to Clifton Turner, Jr. WB5KCQ, 6319 Boef Trace, Alexandria LA 71301, and ask for more information. Don't forget to plug us, here, OK?

FAX appears to be one topic which, along with copying press RTTY, anyone with the capability of copying likes to keep around to impress visiting civilians. Paul Cournoyer N2FPB, of Ballston Spa NY, is one of those folks who is using a CoCo and the public domain WEFAX program to copy pictures. He finds good copy on 18.431 MHz from 5 p.m. to 9 p.m. EST, and notes another signal on 10.330 MHz at around 8 p.m. EST.

Another list that has come into the shack is printed in Figure 1. Here is one ham's compendium of all kinds of FAX information. Have fun, folks!

Next month will find more of your questions and topics. On tap for future months is yet another CoCo RTTY program, which combines some of the best features of all those yet published, as well as material for several other systems. Don't forget to direct your questions to me either by mail or electronically on CompuServe (75036,2501) or Delphi (MARCWA3AJR), with mailed questions accompanied by a self-addressed, stamped envelope if you desire a personal reply. Let me hear from you! It is your input that makes this column what it is.■

from page 11

send (which, egotistically speaking, I doubt).

For the record, if you ever hear me on the air, I am KE2P/M2. That means I am mobile, very likely in motion (yes, even on CW!), and in the second call district.

Last but not least, I almost worked a guy just last night. I say almost, because after he gave me a 579 report (he was on my receiver), he said he could not copy me. You guessed it: too much QRN. But since he had gotten my call right, KE2/2, imagine my surprise when he asked me to turn my beam toward Florida! Can you imagine a 40 M beam on the back bumper of my little Dodge Omni??!!

Maybe a few guys will have something to think about—at least I got some of it off my chest.

Christopher CJ Johnson KE2P
Fords NJ

STILL A THRILL

I was attracted to ham radio in the 50s because it was a lot of fun, offered a challenge and was a bit more exclusive than bowling. I like sending, receiving, junkboxing, improvising, building, troubleshooting, and making things work.

Being able to copy most anything anyone can send gives me a good feeling. Building a receiver that worked put me on cloud 9 for a long time. My first contact on a homebrew TX will never be forgotten.

I hope the new hams of the 80s can get those same thrills from: 1. Buying 2. Plugging in 3. Talking.

Lee Anderson VE1AYX
Canada

LAW & ORDER

In the July issue you carried a letter from a person who admitted to unlicensed operation on the Amateur Radio frequencies. *73* Magazine has long claimed to be interested in furthering the interest of amateur radio. I am unable to see how unlicensed operation furthers the interest of our hobby.

The problem of unlicensed appliance operators or the amateur radio bands is a problem that we do need to address. We are supposed to be a self-policing fraternity.

Frank Law
Montgomery AL

IT'S A CINCH

I enjoy my subscription to your magazine very much. I like the interesting articles that are intermixed with humor.

I recently acquired my Novice license and can't wait to get on the airwaves. I found both the written and the code test very easy. Here comes the catch. I don't agree with your articles on the no-code license (May '87). There are two reasons for my different point of view:

1) Anyone with true ambition could pass the slow 5 WPM exam, and

2) The prospect of an impossible code discourages those who wish to get a license and can ruin fun for others by resulting in violated laws.

Thank you for considering my opinion on this touchy matter. I would love a reply in any form. Congrats on a great magazine.

Aaron Whitten KB0ANU
Noel MO

CHEERS

I just thought that I would drop you a note telling you how much I enjoy your magazine. I have been relativly inactive in the past 7 or 8 years or so except for some FM usage.

I had recent occasion to read a copy of your magazine and was surprised to see all the things that I was missing including packet.

I also saw that Novices and Techs were allowed to use new portions of our bands. I determined that I should buy a new rig to sharpen my skills on CW in order to upgrade to a higher grade of license. Of course, I read through your magazine to find a good buy. I purchased my new rig from one of your advertisers.The rig is great, and I'm listening to CW every night now. Thank you. I'll spread the word.

George F. Ledoux K1TKJ
Modesto CA

HAMSATS

Andy MacAllister WA5ZIB
2310 Romayor Court
Pearland TX 77581

SATELLITE MOBILE

Want to try something a little different? How about mobile satellite work? With RS10/11, it's easier than ever to track satellites from the car. As reported last month, the RS10/11's downlink signals are LOUD and the receivers are quite sensitive. In early July, W2RS worked W1NU via Mode A (two up and 10 down) with only 100 milliwatts from his HT to a rubber-duck antenna. Of course, to get consistent operation, you would want to use a bit more power and antenna. Mobile rigs and antennas do the job nicely.

The new RS satellites have three modes. Modes A and T (15 meters up and two meters down) lend themselves well to mobile operation. Mode K (15 up and 10 down) is possible, but can be very difficult. There are desense problems caused by the 15-meter transmitter's close proximity to the 10-meter receiver and antenna. Since Mode K and Mode T are frequently active at the same time, it's easier to use Mode T and control 15-meter desense by listening on two meters, rather than Mode K's 10-meter downlink. The VHF signals are also less disturbed by atmospheric noise and fading.

Mobile Equipment

Photo A shows my basic Mode T mobile system. The Kenwood TS-130S provides between 50 and 100 Watts output on 15 meters. Since I run about the same power from my home rig to a ground-mounted vertical, the TS-130S looked like a good choice for the car.

For reception, the Santec LS-202A HT does a great job with the Advanced Receiver Research GaAsFET preamp. It took some practice using thumbwheel switches in conjunction with the very small VXO control, but the results were worth it. The several dozen Mode T satellite contacts I've made from my car have allayed any misgivings I may have had about my choice of equipment.

Mobile Antennas

The day after I bought my present car, I drilled holes in it for two-meter and 220-MHz antennas. The two-meter Larsen 5/8-wave whip is fine for satellite work. A nice ball mount in the top of the car's roof would be excellent for a 15-meter antenna, but I opted for something a bit less permanent.

CB mag-mount antennas are relatively inexpensive from discount stores. A sturdy black Sparkomatic antenna with a three-foot whip cost less than $20, and looked like it would come apart for modifications.

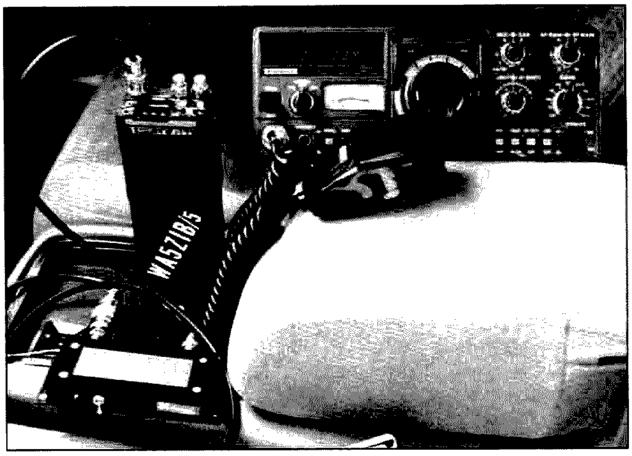
Getting into the coil assembly proved to be difficult, but not impossible. It took a vise, a rubber mallet, some light oil, and careful persuasion.

Most CB mag-mounts are similar in wiring if not construction. This one had a 24-turn coil of 16-guage copper wire. One end of the coil connected to the ground side of the RG-58 coax, while the other end went to the fiberglass whip. The coax inner conductor was attached to the coil four turns up from the ground side.

After a disappointing search through all of my radio manuals and magazines for information on moving 11-meter mag-mount antennas to 15 meters, I made a few calculations and started experimenting. It took several attempts, but the end result worked very well.

On my antenna, the bottom four turns are physically separated from the upper loading coil of 20 turns, so I left the four-turn section alone. It provided impedance-matching and needed no change when moving from 11 to 15 meters.

The upper section of 20 turns required some modification. The 16-guage wire was tightly wound, filling the space provided. I removed it, substituting 26 turns of 24-guage wire. It is not as tightly wound as the previous coil. The



WA5ZIB's Mode-T mobile system. The Kenwood TS-130S provides between 50 and 100 Watts output on 15 meters. For reception, the Santec LS-202A HT is used with the Advanced Receiver Research GaAsFET preamp.

turns can be compressed or separated a bit to tune for lowest swr. I made all swr checks with the antenna on the car in the position it would have for later operation. When I got down to 1.2:1 on 21.2 MHz, I taped the upper 26 turns to hold them in place and put everything back together.

In addition to being a great performer for satellite uplinking, this 15-meter mag-mount has also done very well for casual mobile HF operation. The swr is a bit higher around 21.4 Mhz, but the radio still puts out plenty of power for some enjoyable drive-time contacts when the satellites are not in my sky.

"The new RS satellites have three modes. Modes A and T (15 meters up and two meters down) lend themselves well to mobile operation."

I keep another inexpensive mag-mount in the trunk for Mode-A downlink operation. It is also an ex-CB antenna, which I have tuned for 10 meters.

This is very easy to do. Instead of adding turns, simply remove one or two off the top end. Then, start checking the swr for resonance in your favorite part of 10 meters. I had considered setting mine for resonance around 29.4 MHz, but opted instead for 28.4 MHz to have good transmitter operation in the most active part of the band. Satellite receive sensitivity was not impaired at 29.4 MHz, and the HF activity has been a lot of fun in the middle of the new Novice phone band.

Pitfalls

If mobile satellite activity is so easy, why doesn't everyone do it? Because, while dealing with receiver desense, ignition noise, power-line noise and signal fading, you are supposed to be driving without running into anyone!

These problems, with the exception of receiver desense, are minimized by stationary mobile operation. Ignition noise can come from your vehicle, but it is surprising how much comes from other cars, trucks and, especially, motorcycles. A radio with a good noise blanker really helps.

Most of my "mobile" contacts occur when I am parked. I use roadside rest stops while on long trips, or parking lots and friends' driveways while in town. For those few mobile-in-motion QSOs, I have been the passenger or have had a good co-pilot to watch Doppler shift, the logbook, and the traffic.

Power-line noise is something with which all mobile enthusiasts have to deal. If you are looking for a place to catch a satellite pass, search for a quiet spot. It is embarrassing to be in the middle of a good contact just to have it overwhelmed by high tension lines or a bad pole transformer. With HF mobile, a few minutes to get by the noisy area is no problem. With satellite mobile work, a few minutes could represent a large part of the whole pass. Even a good noise blanker may not help.

Simple vertical antennas can have problems with signal fading on both uplink and downlink signals. Other antenna designs

could help on two-meters. Turnstiles and horizontal halos are two examples. Fortunately, the signals from RS-10/11 are so good, that the fading problems won't keep you off the air. Don't expect dramatic results on extremely low horizon passes, but also don't be surprised if you can hear Mode T downlink signals well over S9 on a 20-degree pass.

Mobile-to-Mobile

Eventually it had to happen. While catching a quick RS-11 pass out in the office parking lot one day, I tuned across N6DGK doing the same thing. I don't know how many mobile-to-mobile contacts have occurred via hamsats, but they are certainly not common.

Tom N6DGK runs whip antennas on ball mounts. A Yaesu FT-77 and a Kenwood TR-9000 keep him on the air for Modes A and T. You may also run into Tom on Fuji-OSCAR-12. When F-O-12 is in Mode JA, the analog mode, it, too, can provide quality contacts from simple mobile or portable earth stations.

Many hams have found that high uplink power levels and GaAsFET preamps for downlink reception are not necessary for RS-10/11 operation. Obviously, high-gain antenna arrays aren't required, either.

Even if you don't go for satellite mobile work, at least get some two-meter and HF gear together at the house and join the new RS crowd. Many previously unheard calls have shown up, and I have had the pleasure of providing first-ever satellite contacts to several pioneering enthusiasts.

AMSAT Annual Meeting

The 1987 AMSAT General Meeting and Fifth Annual Space Symposium is almost upon us. The AMSAT gatherings used to take place only in the Washington, DC area, but have since occurred in Los Angeles, Vail, and the Dallas-Fort Worth area.

Why not make plans to attend this year? The site will be the Southfield Hilton, just north of Detroit MI, Saturday November 7th. This location is within a one-day drive of a very large percentage of U. S. amateur radio operators and space enthusiasts.

The Space Symposium is composed of many fine forums. They are usually scheduled sequentially. This year there are so many talks set up for Saturday, there will be two occurring simultaneously throughout the day. Because of this conflict, an effort has been made to keep the technical hamsat talks opposite more generalized space topics. This will allow those interested in science and spaceflight to fill the day with pertinent material, while the dedicated hamsat chaser can sit in on technical nuts-and-bolts discussions. A copy of the proceedings (the technical papers) will be available to fill in the gaps during those times when you can't be in two places at once.

Last year's AMSAT Conference in North Texas was one of the best ever. The AMSAT area coordinators in Ohio, Indiana and Michigan have been working hard to make this year's event another success. With live demonstrations, displays, and exhibits, and a grand selection of banquet prizes, no one should be disappointed.

If you are an AMSAT member, you will be receiving the conference registration materials. If not, then call AMSAT today at (301) 589-6062 for the appropriate forms. By attending, you will find out how best to use our present hamsat resources and are guaranteed a glimpse into the future of amateur satellite projects from now till the year 2000.

Satellite Updates

The new RS10/11 combo continues to be a major news topic. This newest satellite pair has provided us with a functional communications medium for the beginning satellite chaser. They've also provided new challenges to long-time hamsat users who prefer low-earth-orbit satellites. No schedule of operation has been reported, but from all indications, Modes K and T on either RS-10 or RS-11 will likely be dominant.

Fuji-OSCAR-12 devotees have been rewarded with some short-term scheduling. Typically we have seen a day of recharge for every day of operation. The operating days have been split almost evenly between Modes JA and JD, analog and digital modes respectively. To keep up with changes on F-O-12, monitor the AMSAT nets.

AMSAT-OSCAR-10 is scheduled to emerge from hibernation in early November, when sun angles will allow guarded transponder operation. In mid-December, solar panel illumination will be close to 100 percent. The last fully illuminated period, which was around Field Day, provided excellent signal levels and DX contacts. Operator restraint, with careful attention to scheduling information, is the only way to prolong the life of this veteran satellite. ■

FUN!

John Edwards KI2U
PO Box 956
Mt. Laurel NJ 08054

GETTING ON THE AIR IN PIECES

I've had many love/hate relationships in my life. Perhaps the most intense of these affairs have been my encounters with various electronics kits.

Ah! Ameco, Knight Kit, Heathkit®, Eico! Just the mention of those immortal names brings the bittersweet smell of burning solder to my nostrils and makes my fingers yearn to bend a resistor lead or two.

I was bitten by the kit bug early in my ham career, before I got my first ticket. My initial project was an Ameco AC-II, a 40-meter transmitter that allegedly generated about 20 Watts of undiluted rf energy. I think the ad copywriter was under the influence of hyperbole. Still, to a 13-year-old, it had the same kind of allure as a Collins rig.

As with all kits, the easiest part of this project was buying the AC-II and bringing it home. In splendorous innocence, I opened the box, tipped it upside-down and spilled all of the components out on the kitchen table. Fortunately, the AC-II was a relatively simple kit, so it didn't take me long to re-sort those parts and rectify my error.

The next several nights were spent in a glorious haze of frenzied activity. You know, I've often wondered if burning solder has some sort of narcotic effect. I don't know what medical science has to say on the subject, but I do remember being kind of high during that time. Perhaps it was the sheer exhilaration of becoming a "real ham."

A REAL HAM! Just as primitive tribes take male adolescents into the field to be ritually tattooed or scarred, I received my mark of manhood that night. I still proudly carry my fraternal solder-burn scar on my left forearm. I wouldn't part with it for all the laser surgery in the world.

Three days later, I completed my project. That evening, my Elmer came over to judge my work. He laughed. I think it had something to do with the resistors that swayed gently on three-inch-long leads or the crooked sockets that made the tubes stand as true as windswept trees. Then again, perhaps it was the fact that so many of the components protruded from the chassis' bottom panel that it was all but impossible to place the unit on a conventional tabletop. I told my Elmer I planned to operate the transmitter sideways. He laughed again and promised to make "a few changes." Three days later, the AC-II was back in my hands, looking considerably more polished. You could now place it on a table, for instance.

My next project, about two years later, was a Heathkit Sixer—the famous Benton Harbor Lunchbox. I had my Tech ticket by then, and was very anxious to get on six meters despite the current sunspots minimum and the fact that channel 2 was the local CBS affiliate.

By this time, I had learned the lesson of keeping leads short. What I neglected to remember was that power circuits can pack a mighty wallop even several minutes after power has been shut off. The smell of burning flesh killed my interest in the Sixer and I gave it to a friend.

Over the intervening years, I guess I've built at least a dozen kits, including a 2-meter repeater, an oscilloscope, a low-band receiver, a VTVM, and a QRP transceiver. All of these projects were completed with various degrees of success. But my most recent project, tackled after a seven-year layoff, was an exercise in future shock—a packet radio terminal node controller. There must be something in common between an Ameco AC-II and a terminal node controller kit, but I'll be damned if I can tell you what it is. Upon opening the kit's box, I felt like a blacksmith magically transported into the 21st century. I knew I was in serious trouble when I couldn't even identify more than 50 percent of the parts. I started calling components "that black round thing" and "the blue-red bubble whatever."

At first, the kit and I got along splendidly. I spent three evenings soldering components to a printed circuit board, an action not as soul-satisfying as point-to-point wiring but infinitely easier.

Night four was my Armageddon; the Gotterdammerung of my kit-building career. That was the night the chips had to be plugged into their sockets.

Friends, let me tell you, God as my witness, I didn't know you couldn't comb your mustache with the legs of a CMOS chip. In fact, as I later discovered, you can't even safely wiggle your ears within 20 yards of one. Tubes were, and still are, indestructible. Chips are, well... *very* destructible.

So, in perfect hindsight, I now realize that I caused at least $200 in damage to my kit before I even plugged the damn chips into the circuit. As it turned out, I should have given up while I was playfully stacking the chips on my kitty cat's back. I didn't. I proceeded—innocently and blindly. And I encountered an additional, more obvious, problem.

Fellow radio amateurs, fifty-pin dual-inline chip packages were not meant to be inserted into sockets by hand, manufacturer's claims to the contrary. It just doesn't work. Human hands cannot make them fit. These chips were designed to be inserted by machine and with machines they should stay.

One by one, almost systematically, I single-handedly destroyed 15 chips that evening. Before the night was over, pins were bent, pins were twisted and pins were broken. Likewise, my kit-building spirit was bent, twisted, and broken. That evening, I did something unprecedented in 20 years of assembling electronics kits, with all its frustrating times and happy times: I cried.

In a flash, I realized my kit construction days were behind me. Technology, flying as fast as a bullet in the night, had passed me by. Feeling like a worker whose job has been made superfluous by progress—like a lamplighter, telegrapher, or milkman—I reluctantly put down my soldering iron.

Sometimes, on cold winter evenings, I still think of my old Ameco AC-II, with its mercury-vapor tube casting a hazy blue glow across the decades. The thought makes me nostalgic, but I know I'll never build another kit. ■

you install), use a plastic strip instead. The replacement plastic strips are evidently standard with the paper refills and should cause no problems.

The unit is extremely well engineered and rugged and delivers a good account of itself in chart service. It is competitive, price-wise, with systems using a dot matrix printer (hardware plus printer) and will deliver superior results with no compromise and essentially no noise! If you want to copy HF weather charts, the Alden *Weatherchart* recorder is certainly a system you should look at. Based on the cost of paper (in lots of 6 cassettes), your per-chart cost will run about $.22—you will want to be selective in your choice of charts from the daily schedule once the novelty has worn off. A digital timer to turn the unit on and off at selected times of the day would do the job nicely.

Satellites

As it stands, the Alden recorder is *not* suited for weather satellite use. At the very least, to provide 120 LPM printout of TIROS/NOAA and METEOR imagery, it would require an external AM video and printing circuit in order to demodulate the satellite signal and get a good grayscale. Even if you made those modifications, you would not be able to copy GOES or METEOSAT WEFax pictures since the line rate and IOC are off (you would need 240 LPM and an IOC of 288). But that gets us to the reason why I was interested in looking at the Alden despite my fixation on satellite pictures. Keep an eye on the WEATHERSAT column and I will show you how the Alden or *any* Fax machine can be used to copy excellent pictures from *any* weather satellite, regardless of any incompatibilities in format! The Alden is a rugged, reliable package offering you satellite possibilities. ■

SPECIAL EVENTS

MARFA CHAMBER OF COMMERCE
OCT 2-4

The Big Bend ARC will operate K5FD on Oct. 2-4, from the Marfa Lights Festival from 1500Z - 0000Z on suggested frequencies: Phone—3.920, 7.250, 14.250, 21.400, 28.400. For certificate, send QSL and SASE to Stewart Billingsley N5HXZ, PO Box 1458, Marfa TX 79843.

T.A.R.A. HAMFEST
OCT 3

The TRI-STATE AMATEUR RADIO ASSOCIATION will hold their Annual Hamfest at the Huntington Civic Center, Huntington, WV Saturday Oct. 3, from 9 a.m. to 4 p.m. Admission is $4 and flea market tables are $4. All activities are inside. Talk-in 146, 16/76. For more information contact Paul Patton NT8M, PO Box 652, Huntington WV 25711.

CARA SWAPMEET
OCT 3

The annual swapmeet of the Cochise Amateur Radio Association will be held at the club's Training Facility on Moson Road, Sierra Vista AZ. Talk-in on 146.16/.76. No charge for tailgaters. Refreshments available. Contact Jacquie Kelly KD7DZ,(602)-458-4107 or write CARA, PO Box 1855, Sierra Vista AZ 85636.

CLOVIS CA
OCT 3-4

The Diamond Jubilee Special Event Station. The Fresno Amateur Radio Club emergency communications van will operate W6TO in the City of Clovis for their Octoberfest-Crafts Faire-Pioneers' Day, on the site of their newly remodeled downtown. For a handsome certificate, OSI 8½x11 SASE to W6TO F.A.R.C., PO Box 783, Fresno CA 93712-0783. Operating time is 1500Z Oct. 3 to 0100Z Oct. 4, 1987. Suggested frequencies: lower portions of General 80/40/20/15M bands, Novice phone 28.450, CW 7.130 and 2 meter rpt. 146.82/22 or 146.94/34.

MODEL T COMMEMORATAION
OCT 3-4

The Ford Amateur Radio League, the Tin Lizzie Club, will operate K8UTT and member stations Oct. 3 and 4, 1200Z to 2200Z, to commerorate the first Model T Ford built Oct. 1, 1908. Operations in the General portions of the 80-40-20 meter bands. For 8½ x 11 certificate, send SASE and QSL to member station or to K8UTT, Ford Amateur Radio League, Box 2112, Deerborn MI 48123-2112.

TOPEKA KS
OCT 3-4

The Kaw Valley Amateur Radio Club will operate WØCET, its Memorial Call Sign Station Oct. 3 and 4 as a special event station in celebration of John Amis' call sign 9CET. Suggested frequencies: 10 m, ±28.400; 20m, ±14.275; 40m, ±7.275. Time will be 1500Z-2300Z for both days. For a certificate, send a SASE to Terry Hoss KAØBHO, 2931 Tutbury Tn. Rd., Topeka KS 66614.

12TH ANNUAL HAMFEST
OCT 3-4

The ARRL Virginia State Convention and 12th Annual Hamfest/Computer Fair will be at Virginia Beach Virginia Pavilion on Saturday and Sunday, Oct. 3 and 4. Don't miss seeing all the latest equipment that will be presented by ALINCO, ICOM, KENWOOD AND YAESU. ARRL VEC license upgrade exams will be given Sunday at 9 a.m. For more information and tickets, call or write Manny Steiner K4DOR, 3512 Olympia Lane, Virginia Beach VA 23452; (804)-340-6105.

ALEXANDRIA VA
OCT 3-4

The Mount Vernon Amateur Radio Club will operate K4US from Gunston Hall Virginia on Oct. 3 and 4, starting at 1500Z each day to commemorate the Constitution of the U.S. This is in coordination with the Bicentenial Commision of the U.S. Frequencies will be 25 kHz up from the bottom of the General portion of 80 SSB, 40 CW, 20 SSB, and 10 m Novice SSB. HF -Packet station will also be operating. Send OSL and SASE to Steve Schneider WB4EEA, 8602 Cushman Pl., Alexandria VA 22308.

FULLERTON CA
OCT 4

The Rehab Radio program at St. Jude Hospital in Fullerton, California will mark its tenth anniversary on the air with a special event operation. The operation will be chiefly on 10 meters (28.3 to 28.6 MHz) and 15 meters (21.3 to 21.4 MHz). In case of poor band conditions on 10 and 15, there may be operation on 20 meters (14.2 to 14.3 MHz). Sometime will also be devoted to two meter FM operation on local repeaters. WD6BPT special event station operation will commence Sunday, October 4 from 2000Z to 2400Z, with an open house at the station from 2100Z to 2400Z. Send QSLs to WD6BPT, St. Jude Hospital, PO Box 4138, Fullerton CA 92635.

SALT PLAINS LAKE OK
OCT 4

Salt Plains Amateur Radio Club Eye Ball QSO Party at the South Side of Salt Plains Lake, North Central Oklahoma on October 4 on talk-in 147.30/90 or call Gary Gerber KBØHH (316)-842-5079.

WEST LIBERTY IA
OCT 4

The South East Iowa Hamfest sponsored jointly by the Muscatine and Iowa City Radio Clubs will be held at the West Liberty, Iowa Fairgrounds. ARRL/VEC Exams start at 10 a.m. with walkins accepted. A Saturday Night Campers Special weiner roast with all you can eat, hay-rack rides, flea market under the stars, and a fox hunt. Gate opens at 7 a.m. Oct. 4. Talk in will be held on 146.31/.91, 146.25/.85 and 146.52. For Information contact Ken KAØY at (319)-648-5037 or Tom KEØY at (319)-264-3259; or write Muscatine Iowa City Amateur Radio Club, PO Box 5466, Coralville IA 52241.

SPRINGFIELD OH
OCT 4

The Independent Radio Association will be holding the Fifth Annual Springfield Ohio Hamfest and Computer Expo on Sunday, Oct. 4, from 8 a.m. to 4 p.m., at the Clark County Fairgrounds. Talk-in on 145.45 or 224.26 MHz. For advanced reservations write the Independent Radio Association, PO Box 523, Springfield OH 45501 (SASE), or call Steve KA8QCS, at (513)-882-6521.

YONKERS NY
OCT 4

The Yonkers Electronics Fair and Giant Flea Market will be held at the Yonkers Municipal Parking Garage, Yonkers NY. The event will be sponsored by the Yonkers Amateur Radio Club on Oct. 4 at 9 a.m. to 4 p.m. Talk-in on 146.865/R, 440.150/R or 146.52. For more information write YARC, 53 Hayward St., Yonkers NY 10704; (914)-969-1053.

ROME GA HAMFEST
OCT 4

The Rome Georgia Hamfest sponsored byt the Coosa Valley Amateur Radio Club will be held on Sunday, Oct. 4, at the Rome Civic Center. Amateur Exams by Central Alabama VEC begin at 8 a.m. sharp. Reservations requested but walk-ins will be accepted. For more information contact Bobbie Carol Waller KA4DXU, 24 Wellington Way, SE Rome GA 30161; (404)-235-5417.

WARRINGTON PA
OCT 10

The Pack Rats (Mt. Airy VHF ARC) cordially invites all amateurs and their friends to the 11th Annual Mid-Atlantic VHF Conference on Saturday, Oct. 10 at the Warrington Motor Lodge, Warrington PA. For advance registration write to, Hamarama '87, PO Box 311, Southampton PA 18966; or call Pat Cawthorne WB3DNI, at (215)-672-5289 for more information.

DEERFIELD NH
OCT 10

The Hosstraders will hold their fall Tailgate Swapfest on Saturday Oct. 10 at the Deerfield NH Fairgrounds. Friday night camping at nominal fee, but aboslutely no admission before 4 p.m. Friday. Profits benefit Shriners' Hospitals. For a map send a SASE to Norm Blake WA1IVB, RFD Box 57, West Baldwin ME 04091.

DALTON GA
OCT 10-11

The Dalton Amateur Radio Club will operate special events station KI4IG on Oct. 10 and 11, from 1400Z to 2000Z at the Prater's Mill County Fair activities. Suggested frequencies (all ±): 7.250, 14.250 and for Novice 28.400 MHz. For special QSL card, send your QSL and SASE c/o Dalton ARC, PO Box 143, Dalton GA 30722-0143.

HARLINGEN TX
OCT 10-11

The South Texas Amateur Repeater Society (STARS) announces the operation of N5CAF October 10-11 at 1400Z to 2300Z to commemorate the annual confederate Air Force Airshow held in Harlingen Texas. Suggested frequencies: 7250 kHz, 21325 kHz and 28400 kHz. A special commemorative QSL will be available to all stations worked. Send QSL and SASE to Dr. David Woolweaver K5RAV, 2210 S. 77 Sunshine Strip, Harlingen TX 78550.

WICHITA KS
OCT 10-11

The Wichita A.R.C. will host the 1987 Kansas State ARRL Convention and Ham Fest at the Broadview Ramada Hotel in downtown Wichita, Kansas. Doors will open at 9 a.m. both days. Indoor Flea Market, Saturday night banquet and Sunday morning breakfast. Talk-in on 146.82-600. Preregistration and dealer information contact: Vern Heinsohn WAØZWW, %Wichita Amateur Radio Club, 707 N. Main, Wichita KS 67203; (316)-264-2796.

LANSING CIVIC CENTER
OCT 11

Ham Fair '87 will be held in a new location this year, at the Lansing Civic Center in Lansing MI on Oct. 11. It is the Central Michigan's Largest Amateur Radio Event. The talk-in frequencies: 145.39 and 146.94. For more information and reservations contact Rowena Elrod KA8OBS, 11 Lancelot Place, Lansing MI 48906; (517)-482-9650.

TRI-CITIES HAMFEST TN
OCT 17

The Seventh Annual Tri-Cities Hamfest will be held Saturday, Oct. 17 at the Appalachian Fairgrounds, Gray TN. Talk-in on 146.37/97 and 146.01/61. For further information write: Tri-Cities Hamfest, PO Box 3682 CRS, Johnson City TN 37602.

SYRACUSE NY
OCT 17

The Radio Amateurs of Greater Syracuse will be holding their 32nd hamfest in the Arts and Home Center at the New York State Fairgrounds on

Saturday, Oct. 17. Talk-in on 146.31/91 and 147.90/30. Programs for non-hams. For more information call Ed Swiatlowski WA2URK (315)-487-3417, or Viv Douglas WA2PUU (315)-469-0590 or write RAGS, PO Box 88, Liverpool NY 13088.

30TH SCOUT JAMBOREE ON THE AIR
OCT 17-18

Jamboree On The Air, or JOTA, is an annual Scouting/Amateur Radio event sponsored by the World Bureau of the World Organization of the Scout Movement. Calling Frequencies are: CW-3,590; 7,030; 14,070; 21,140; 28,190. Voice-3,940; 7,290; 14,290; 21,360; 28,990. Please move off these frequencies to avoid QRM. and PACKET, RTTY, SSTV, ATV on usual frequencies.

EDMOND
OCT 17-18

The Edmond Amateur Radio Society, a special service Club, will operate W5ERY from 1700Z October 17 to 1700Z October 18. This in celebration of Edmond Amateur Radio Society 30th Anniversary as an Amateur Radio Club. The Special Event Station will be operated on the shores of beautiful Lake Aracdia. Suggested frequencies include: 3.870, 7.270, 14,100 (CW), 14,270 and 147.135 +. For more information, contact Edith Vaughn KA5YPX, 1020 Juno Circle, Edmond OK 73034.

MARSHALL MO
OCT 17-18

The Indian Foothills ARC will operate WB0WMM from the National Cornhusking Championships on October 17 and 18, 1400Z to 1900Z each day. Suggested frequencies: CW-7.11 and 21.11, phone- 7.235 and 14.235. For certificate send a large SASE and QSl to WB0WMM (callbook address) or 125 Lakeview, Marshall MO 65340.

POTEAU OK
OCT 17-18

The Fort Smith AR Area ARC will operate special event station W5ANR in conjunction with the 1st Annaul Green Country Sorghum Festival to be held in Poteau OK. Operation will be from 1500 to 0300Z Oct. 17 and 1500 to 2300Z Oct. 18 in the lower 30 kHz of the general phone bands, 28.435 in novice phone and 145.01 on packet. For certificate, send QSL and SASE to FSAARC W5ANR, Box 32, Fort Smith AR 72902-0032.

CARLISLE PA
OCT 18

On October 18 the C-CARS will sponsor the 4th Annual Cumberland County Hamfest at the Carlisle Fairgrounds 7 a.m. to 3 p.m. C-CARS is the Third Call Area QSL Bureau and you may put envelops on file. Talk-in on 145.52 and 433.3. For additional information send a SASE to C-CARS, PO Box 448, New Kingston PA 17072.

QUEENS NY
OCT 18

The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot on October 18. (The raindate will be October 25). It starts at 9 a.m. to 3 p.m. on Flushing Meadow Park, 47-01-111 Street, Queens New York. Amateur Radio exhibit station, tune up clinic, films. Talk-in 144.300 simplex link 233.600 repeat and 445.225 repeat. For further information call at night Steve Greenbaum WB2KDG at (718)-898-5599, or Arnie Schiffman WB2YXB (718)-343-0172.

LAKE TEXOMA LODGE OK
OCT 24-25

"NASA and Amateur Radio - Past, Present and Future," featuring Lou McFadin W5DID, NASA's SAREX Project Manager, will headline the programs at TEXOMA HAMARAMA '87, scheduled for Lake Texoma Lodge, over looking beautiful Catfish Bay. Also on the progam of this ARRL sanctioned hamfest will be the ARRL Forum with West Gulf Director Jim Haynie, and Vice Director Tom Comstock; and technical programs presented by ARRL Technical Advisor Al Markwardt, and others. A full line of Ladies' programs, amateur exams, indoor and out door fleamarkets, dealers and QCWA activities are also on tap. For additional information contact: Texoma Hamarama Association, PO Box 610892, DFW Airport TX 75261.

HEART OF OHIO HAM FIESTA
OCT 25

The Marion Amateur Radio Club will hold its 13th Annaul Heart of Ohio Ham Fiesta on Sunday, Oct. 25, from 0800 to 1600 hours at the Marion County Fairgrounds Coliseum. Talk-in on 146.52 or 147.90/.30. For information, tickets, or tables contact Ed Margraff KD8OC, 1989 Weiss Ave., Marion OH 43302; (614)-382-2608.

KALAMAZOO MI
OCT 25

The Southwest Michigan Amateur Radio Team and the Kalamazoo ARC are Sponsoring the 5th Annual Kalamazoo Hamfest. New larger location at the Kalamazoo Central High School on Oct. 25 at 8 a.m. to 4 p.m. Talk-in on 147.64/.04 and 146.52. Walkin VE testing. For more information send SASE before Sept. 28th to Jim Hastings/Kalamazoo Hamfest 1813 Greenbiar Dr., Kalamazoo MI 49008.

WAUKESHA WI
OCT 25

The Kettle Moraine Radio Amateur Club Inc. will hold its annual Ham Computer, Video Fest at the Waukesha County Exposition Center on Sunday Oct. 25 at 8 a.m. Please contact KMRA Club, 313 Hillview Circle, Waukesha WI 53188 for more information.

BARTER 'N' BUY

MARINE RADIO: Marconi Canada CH-125 synthesized AM/SSB transceiver, 22 channels on 4, 8, and 12 MHz, 125 Watts, 12 V dc. Never used, list $1,995, asking $1,495. Stu Norwood, 70 Rte. 202 North, Peterborough NH 03458. BNB047

QSLs to order. Variety of styles, colors, card stock. W4BPD QSLs, PO Drawer DX, Cordova SC 29039. BNB260

THE DX'ERS MAGAZINE. Up-to-date, informative, interesting. Compiled and edited by Gus Browning W4BPD, DXCC Honor Roll Certificate 2-4. Send for *free* sample and subscription information today. PO Drawer DX, Cordova SC 29039. BNB261

XEROX MEMORYWRITER—parts, assemblies, boards, manuals. Free help with service problems. W6NTH, Box 250, Benton AR 72015 (501) 776-0920. BNB404

HAM TRADER YELLOW SHEETS, in our 24th year. Buy, swap, sell ham-radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. $12 for one year (24 issues). PO Box 2057, Glen Ellyn IL 60138-2057. BNB412

QSL CARDS—Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSLs, Dept. A, 310 Commercial, Emporia KS 66801. BNB434

LEARN CODE on your IBM PC (or compatible), Commodore C-64/128, or 512K Macintosh. CODE-PRO takes you *from* no knowledge to proficient copy. Specify computer. $10 plus $2 S&H. Trio Technology, Dept. 861, PO Box 402, Palm Bay FL 32906. BNB490

POST CARD QSL KIT—Converts post cards, photos to QSLs! Stamp brings circular. K-K Labels, PO Box 412, Troy NY 12181-0412. BNB498

VIDEOCIPHER DESCRAMBLING MANUAL—115 pp.—$27.45 ppd. Oak Orion—77 pp.—$22.45 ppd. Satellite catalog $2. Microtronics, PO Box 2517-L, Covina CA 91722. BNB513

SMART BARTTERY CHARGER for gell-cells or lead acid batteries, by Warren Dion W1BBH. See June 1987 *QST* Magazine for circuit details. Complete kit, nothing else to buy, only $49.95 plus $3.50 s/h. Order #150-KIT. A&A Engineering, 2521 West La Palma, Unit K, Anaheim CA 92801 (714) 952-2114. BNB531

HAM RADIO REPAIR, all makes, all models. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128 (408)-729-8200. BNB558

R-390A Receiver: $115, electronically complete, repairable (government-removed meters, operation unaffected). R-390A Parts: Info SASE. Mint military-spec pull-out 12AT7, 6AG5, 6AL5, 6BA6: $15/dozen. CPRC-26 six meter FM transceiver with crystal, hand-set: $22.50, $42.50/pair. Add $4.50/item shipping except R-390A, shipped collect. Baytronics, Box 591, Sandusky OH 44870. BNB564

Barter 'N' Buy advertising must pertain to ham radio products or services.

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SB-220 OWNERS!—Enhance performance—add new features. 11 step-by-step mods which include: tuned-input 6- and 160-meter operation, heavy-duty power supply mods, full QSK operation, solid-state bias control, and many more. Source of parts included. One time 50% rebate for new mods submitted and two free updates. 10 pages of tech info on the 3-500Z. Order today—$10 per copy plus $1 postage. SASE for info. Bob Kozlarek WA2SQQ, 69 Memorial Place, Elmwood Park NJ 07407. BNB581

WANTED: Lafayette PrivaCom 3C, 525, 625, or GE 5813B. RADIO, 2053 Mohave Dr., Dayton OH 45431. BNB589

CHRISTIAN INVESTIGATOR NET Write N9FAQ Blau, 1127 West Hwy 20, Michigan City IN 46360. Three stamps, please. BNB590

WANTED: Military radios and related equipment. Circa: WW II. Command and Field Issue. ARC-2, BC375, BC223, Etc. Complete Collections or Single Sets. Contact: KA1GON; (617) 396-9354 or write: 501 Mystic Valley Pkwy, Medford MA 02155. BNB595

CONTESTERS! Send in your log score with general purpose contest entry forms. 70 spaces. $19/100, post paid. Free info: Mr. Moist, Box 2143, Elko NY 89801. BNB598

ALUMNI OF LOUISIANA STATE UNIVERSITY please write Doug Hensley WJ5J, 5054 Holloway Avenue, Baton Rouge LA 70808. BNB601

MINI AMORPHOUS SOLAR MODULES work in roomlight! Use as micro power supply, small battery charger, sensor. Convert battery calculator to light, maintain memory batteries. 1½-V size: 9µA indirect roomlight to 5.75mA direct sunlight. 3-V size 10µA indirect roomlight to 3½mA direct sunlight. Wholesale cost: $1.05 each 1½-V size and $1.75 each 3-V size plus $1 flat shipping charge. Frank Alexander K6UUU, 540 Discovery Bay Blvd., Byron CA 94514. BNB602

COMMODORE 128/64 OWNERS—Pass your Code Exam! Novice through Extra. Random QSO's, Random Groups. More Ham Programs Available. 12-Volt power supplies for Vic-20, C-64, C-128, and IIc. 12-Volt Monitors. Send for free flyer. THE PEGASUS PROJECT, PO Box 10079, Fairbanks AK 99710. BNB608

BEAM HEADINGS, YOUR QTH to 500 locations. In protective covers suitable for binder. $5.00. NW2J, 1529 Sunset Road, Castleton NY 12033. BNB609

MODULATION TRANSFORMER WANTED: 500w up, Multi-tap, or complete modulator. Bob Mattson KC2LK, 10 Janewood, Highland, NY 12528 (914) 691-6247. BNB610

AM TRANSMITTER WANTED: 500w up, plate modulated. Bob Mattson KC2LK, 10 Janewood, Highland, NY 12528 (914) 691-5247. BNB611

MARCO: Medical Amateur Radio Coucil, operates daily and Sunday nets. Medically oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information, write: MARCO, Box 73's, Acme, PA 15610. BNB612

Voicegate Communications Noise Reduction-Our exclusive "dynaspan" noise reduction, audio gated squelch, 2 notch & 1 peak active filter, automatic tape recorder activator, audio amplifier, and more! See the Bob Grove review in the 5/87 issue of Monitoring Times. An SASE gets you our free brochure or send $3.50 (credited toward purchase) and we'll include our demonstration cassette. Voicegate $109.95. Power pack $9.95. JABCO ELECTRONICS, R1, Box 386, Alexandria, IN 46001. BNB613

KENWOOD 430S owners only! Stop Scan automatically resumes the scan AFTER the transmission finishes! SASE for free brochure. Kit $19.95. Assembled $29.95. JABCO ELECTRONICS, R1,Box 386, Alexandria, IN 46001. BNB614.

WANTED. DRAKE R7A, MS7. All letters answered. Tony Ficarra, 144 Gladstone Avenue, Wollongong. NSW. Australia 2500. Phone (042) 292573. BNB615

Gonset Commander Transmitter and Super 6 Receiver; both work; very good condition; $75.00 OBO. (417) 781-5243, Jon Danford, 2115 Joplin Ave., Joplin MO 64801. BNB616

DX Adventure on Montserrat only $300/week. Details: Chod Harris

VP2ML Box 4881-7, Santa Rosa, CA 95402. BNB618

ICOM u2AT OWNERS—Full transceive mod. Send your rig & check for $25.00. 24 hr turn around. Add $10.00 for Fed-X shipping. Jim Hong KA8ZGP, 3404 Pine Ridge Drive, Jackson, MI 49201. BNB619

SCARA INDOOR HAM RADIO AND COMPUTER FLEA MARKET. Sundya, November 15, 1987 at the North Haven Park and REcreation Center, 7 Linsley Street, North Haven, CT. Sellers admitted at 7 a.m., Buyers from 9 a.m. to 3 p.m. Tables are $10.00 in advance, $15.00 at the door. General admission $2.00 per person. Talk-in on 146.01/.61. Reservations for tables must be received with check by Nov. 4, 1987, and NO reservations by phone. For information or reservations, S.A.S.E. to: SCARA Fleamarket, P.O. Box 81, North Haven, CT 06473 or call between 7 p.m. and 10 p.m. Brad at (203) 265-6478. BNB620

WANTED: EQUIPMENT AND RELATED ITEMS. The Radio Club of Junion High School, 22 NYC, Inc. is a non-profit organization, granted 501 (c) (3) status by the IRS, incorporated under the laws of the State of New York with the goal of using the theme of Ham Radio to further and enhance the education of young people. Your property donation would be greatly appreciated and acknowledged with a receipt for your tax deductible donation. Please contact WB2JKJ using the callbook or telephone (516) 674-4072, 24 hours, seven days a week. Thank you. BNB621

WANTED: Opertional A.C. Power Supply for GONSET G-76 Transceiver, K8HVG, 3520 Campbell, Dearborn, MI 48124. BNB622

CASA MARCONI, INC. Pre-owned communications equipment. We do repairs. CASA MARCONI, INC., 7189 SW 8th Street, Miami, FL 33144. (305) 264-8443. BNB623

SUPERFAST MORSE CODE SUPEREASY. Subliminal cassette. $10 LEARN MORSE CODE IN 1 HOUR. Amazing new supereasy technique. #10. Both $17. Moneyback guarantee. Free catalog: SASE. Bahr, Dept 73-6, 2549 Temple, Palmbay, FL 32905. BNB624

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Homebrew projects lists. SASE WB2EUF, Box 708, East, Hampton, NY 11937. BNB626.

"QSLs & RUBBER STAMPS—TOP QUALITY! States, World Maps, USA, Key, Shuttle, Globe QSLs. Report Form Rubber Stamps. More! Sample Pack—50 cents—Ebbert Graphics D-7, Box 70, Westerville, OH 43081" BNB627

DEAD BATTERY PACK??? NiCad cells / inserts / rebuilding. AA 500mah $1.50, (W/Tabs $1.65) 2/3aa 270MAH $1.85, 2/3af 450MAH $2.40, iCOM bp3 270MAH iNSERT $14.95, KW/TR 2400 Insert (minus plus) $18.95. OR: Mail your pack to us for a Rebuild-Quote. If you don't accept, we return, NO CHARGE! In PA add 6% Add $2.00 S&H/order. CUNARD ASSOCIATES R.D. 6, Box 104, Bedford, PA 15522. BNB628

WANTED: Cop Victern one program tape. For vicmodem phone. For Vic-20 computer. Larry Bailey, 303 Lansing Ave, Louisville, KY 40214. BNB629

CODE PROGRAMS. Apple/C-64 37 Modes, Graphics, Lessons, Wrdprcsr, etc. LARESCO, POB 2018, 1200 Ring Road, Calument City, IL 60409 (312)891-3279. BNB507

COMMODORE CHIPS. Authorized Distributor, Factory Fresh. #6526/6510-$9.95, #6581-$12.85, #6567-$14.75, #8701-$7.25, PLA/82S100-$12.50, 901225/226/227/229-$10.95 and many others....Heavy Duty Power Supply for C64-$27.95...Call Toll Free 800-248-2983 (outside NY or 914-356-3131. Kasara Microsystems, Inc. 33 Murray Hill Drive, Spring Valley, NY 10977. BNB529

COMMODORE REPAIRS. We are the largest Authorized Service Center in the country and we repair your Commodore computer within 3 to 4 days. (Our prices are low; eg. C64-$39.95). New ROMS just received for updating C-128/1571, A MUST. C64 Power Supply $27.95. Call Toll Free 800-642-7634 (outside NY) or 914-356-3131. Kasara Microsystems, Inc., 33 Murray Hill Drive, Spring Valley, NY 10977. BNB587

Never Say Die

from page 63

or $80. Blank video tapes were about $50 each.

They do a pretty good job of keeping all this quiet. Other than a communist newspaper from New York, I saw no American papers or magazines—even for sale to tourists. I checked the short wave bands frequently with my Sony and never heard a single Voice of America station able to get through the Russian jammers. I've heard that the thousands of jamming stations are run mostly by Russian hams. Makes sense.

I didn't see any American TV programs. Heck, they don't have many radio or TV stations. I tuned the broadcast band and heard a couple weak stations in Moscow and two strong ones in Leningrad. FM? One station part time. No wonder they read a lot of books. Without much radio, TV and movies, what else? Lines, I guess.

Though I'm glad I went, Im not anxious to go back. Oh, if I could visit some of the other Soviet republics I might do it—mostly to get my country-visited count up and partly to see if things are as drab and dreary all over the USSR.

I shopped hard in their tourist stores, looking for something to bring back. The only thing which came close was a toy Russian car which I almost bought just to show how poor the quality of the Russian cars is. The toys all had crooked and bent doors—very realistic—even worse fitting than American cars!

If Russia ever lets its people know what a difference there is between their life style and that of America, Europe and a growing bunch of Asian countries, I'll bet the students would start a new revolution. That might keep the government too busy to continue their mischief in Nicaragua, Cuba, Angola, Mozambique, Burma, Syria, Iraq, Afghanistan, and so on.

No, I don't think Fritos are a measure of the success of a country, but where you have one example after another of what free enterprise can accomplish in building a country rapidly and providing its people with a quality of life in food, education, entertainment and happiness, I can't give the Russian system much credit.

Funny thing—most of the daily tours showed us churches—almost all taken over by the government and either closed or used as museums. In Suzdal there were 36 churches, with only one permitted to still be used. Yet, they have little else to show. Even after 70 years of communism there's not much to show.

Their schools still depend mostly on rote learning to pass exams—and unless they pass difficult exams they aren't permitted to advance in their "education" and they're be stuck in a low-paying job. Since memorization has been proven to be one of the least efficient ways to educate people, they've got a terrible problem. But let's not let them know about it since one of the last things we need is a more progressive and efficient Soviet Union stiring up trouble to destabilize the world.

If I do decide to try another trip to Russia, I'll try to start two years ahead and work my way through their bureaucracy so I can visit a ham club. I'll also know to bring along Kleenex, soap, toilet paper, plenty of medical supplies and lots of gum to give the kids.

Their view is that our having twenty kinds of soap in our supermarkets is a waste—who needs more than one? How can we explain that it's the twenty brands of soap being available which pays for our television entertainment—for our magazines, radio. It's the competition which keeps prices low and quality high. Our system works very well—their's doesn't.

Yes, there are some private enterprises in the USSR, but they are only family or group enterprises, since no one is permitted to hire anyone for a salary. This puts a lid on the size of businesses, keeping them entirely mom and pop.

If you're able to actually talk with any of the Soviet hams please let me know.■

73 INTERNATIONAL

NOTES FROM FN42

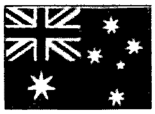
THE October day to celebrate is Saturday the 24th—United Nations Day. The various October days celebrated by nations around the world will be listed here as usual, so hams can say Happy (whatever) as appropriate, but on the 24th all hams everywhere can say with special emphasis, Hello Brother! (Frere, Bruder, Hermano, Brat. . . and for the word in Chinese, the sixth official United Nations language, we'll have to ask our correspondent, Chang Han Dong.) You are on your own with any of the other nearly 200 languages of the world (spoken by a million or more; there are countless spoken by smaller populations.)

National Day: 1—China, Cyrus, Nigeria; 12—Spain (Dia de la Raza); 26—Austria. National Foundation Day, 3—S. Korea; 7—E. Germany. National Holiday, 28—Greece. Three Independence Days: 4—Lesotho; 12—Equatorial Guinea; 28—Czechoslovakia.

Republic Days: 5—Portugal; 9—Kmer Republic, Cambodia; 27—"3Zs" Day, when Zaire became the Republic of Zaire; 29—Turkey. The 8th is Constitution Day in the USSR, the 20th is Guatemala's Anniversary of the 1944 Revolution, and the 21st is Revolution Day in Somalia.

The 2nd is Erntedankfest in Germany, and Canada's Thanksgiving Day is on the 12th. Latin America and the US can be thankful on Columbus Day, also on the 12th. Mothers get thanked in Malawi the 17th, King Chulalongkronis on his Day in Thailand on the 23rd.

The 10th—Health-Sports Day, Japan; 14th—Young Peoples Day, Zaire; 22nd—Labor Day, New Zealand; 31st—Hallowe'en in the U.S.



AUSTRALIA

Jim Joyce VK3YJ
44 Wren Street
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Victoria
Australia

NOVICES ON TWO METERS

Australia is now also going through the dilemma of—will we? or won't we?—have Novice operators on two meters. We have, of course, the usual on-air comments both for and against, with a poll being conducted by the WIA magazine, submissions to the Department of Communications, and so on. Below is a proposal by Jim Linton VK3PC and Rodger Harrison VK2ZTB that looks at the problem and offers a viable alternative to the head-in-the-sand destructive criticism so common today within the amateur radio fraternity.

It is with the authors' and WIA's permission that I reprint this, as it does in part go along a route similar to the USA Novice amateur license.

License Restructure Proposal

The need for restructure of Australia's license system has been ignored by the 1987 WIA Federal Convention proposal to give Novices the entire two-meter (144–148 MHz) band.

That proposal, generated at the Convention, and supported by Federal Councillors from all Divisions except VK1, arose out of two considerations.

The first was the desirable "common band" for all grades of license. The second, which was the major factor in intense lobbying at the Convention, was the impact of the JA/VK reciprocal licensing agreement.

That agreement, effective from February, has consequences for the Novice license and Australia's license restructure generally.

Japan has a long-established telephony license, with an exam of a lower level than the Australian Novice and no telegraphy exam. The JA Telephony licensees operate on low power on HF bands other than 10 and 14 MHz.

Under the JA/VK reciprocal agreement, such JA licensees visiting Australia have been given permission to use FM (10 W) on all bands 50 MHz and above.

How the agreement was reached, the WIA's involvement, and the full story about that exercise is unclear. But what is plain is that the agreement now has a direct influence on the license structure in Australia.

The fact is that should an Australian Novice licensee take the Department of Communications to the Administrative Appeals Tribunal on equal opportunity grounds, DOC could not defend the denial of Australian Novice's telephony privileges on all bands 50 MHz and above. It has brought about a *de facto* Telephony license in Australia.

In hindsight, a two-year tenure should have been placed on the JA Telephony licensees operating in Australia under the reciprocal agreement. It is essential that the agreement be re-negotiated to include a tenure.

To attract the bottom-rung beginner in radio and to expose them to the broad scope of the hobby of amateur radio, a Telephony license should be introduced in Australia.

The theory syllabus for this license could include the necessary elements of basic electricity, magnetism, radio frequency generation, modulation, propagation and interference.

This grade of license could have FM telephony privileges on 52.500–54.000 MHz and a segment on 70cm, at a maximum power of 10 W.

The Australian Telephony license must have a limited tenure of two years.

An integral part of restructuring the license system is restoration of the Novice license syllabus and question bank pool. It has become clear that the Novice license with its recently revised syllabus no longer adheres to its original intention or definition.

The Novice license should be given additional privileges identical to the Telephony license on six meters and 70 centimeters, but with a maximum power output of 30 Watts—plus SSB on the segment 52.030–52.200 MHz.

The enhancements for the Novice proposed above are designed to be greater than those given to JA licensees under the reciprocal agreement, meet the common-band requirement, yet are not a disincentive to upgrade by giving Novices the entire two-meter band.

A further aspect of license restructure should be the introduc-

tion of an intermediate license, to serve two purposes.

Firstly, to bridge the gap between the Novice and AOCP/Limited licenses, and secondly, to attract those people who increasingly these days gain an interest in electronics through computers and computing. It is an essential step if the Amateur Radio Service is to survive by being more attractive to people of all ages.

The intermediate license would require a candidate to have passed the Novice theory, plus a supplementary exam on elementary digital subjects and FM. It would have the six-meter privileges afforded to the Novice license, plus 70cm segments on 433–435 and 438–440 MHz covering FM simplex FM repeaters and digital modes, but all selected to avoid the satellite band.

A candidate who passed the intermediate theory exam/s and the Novice telegraphy exams would have the Novice HF privileges plus permission to use RTTY, AMTOR, ASCII, FAX, SSTV and Packet on the segment 28.200–28.300 MHz.

The data mode privileges would enable Australian intermediate licensees to communicate with USA Novices who have those privileges on that band segment.

Being examined on FM, the Intermediate licensees should either be permitted into the FM international segment 29.000–29.700 MHz and/or FM repeaters be allowed in Australia within the current Novice band.

Intermediate licensees should have access to the 1.2 GHz band in the future.

Holders of the combined Novice/Limited (K-call) license would automatically be given the digital and other HF privileges of the Intermediate license.

The above restructure of Australia's license system would make the hobby appropriate to today's technology and improve its attractiveness to potential radio amateurs. It sets out new entry points into the hobby, and a logical upgrading path leading to increased numbers of licensees with AOCP and Limited license qualifications.

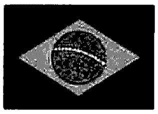
The particular privileges proposed in this document represent a balance between a number of conflicting considerations including the consequences of the JA/VK reciprocal agreement. These privileges are intended to encourage upgrading by those who have the motive to attain the skills.

The aim is to give newcomers an attainable entry into the hobby. Later, the intermediate license gives a taste of digital modes, encouraging further upgrading.

Linton-Harrison License Restructure Chart

Unrestricted (AOCP)	All bands and modes. Full power.
Combined (K-call)	Limited privileges plus Intermediate HF privileges
Limited	All bands 50 MHz and above. No mode restrictions. Full power.
Intermediate (Without CW)	Novice six and 70cm plus FM and digital.
Intermediate (With CW)	As above plus Novice HF bands, 10-meter digital and FM.
Novice	HF 80,15,10; 6-meter SSB and FM, 70cm FM. VHF/UHF power 30 W.
Telephony (2-yr. tenure)	Six meter, 70cm, 10 Watts FM

The document follows on from the discussion paper: "Amateur Radio—Future Direction," coauthored by VK3PC and VK2ZTB in December of 1985. Like that document, its purpose is to promote discussion. It does not necessarily reflect the official viewpoint of the WIA or any division of the WIA.



BRAZIL

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20270 Rio de Janeiro
Brazil

SIX NEW AWARDS

Being part of a Brazilian CW group like the Carioca Woodpeckers, PPC, means keeping a permanent watch about all CW practice around the world. To develop the use of normal bands, to bring friends to the amusement of multibands, the Brazilian PPC has just launched six new awards, greeting not just Brazil but friends on all continents.

Our 5BPPC Award required working five different Brazilian prefixes on each band: 10-15-20-40 and 80 or 160 meters, "AND one PPC member per band, no matter which band for PPC members' QSL."

Now the following join PPC's more than 20 funny awards: All for contacts valid from January 1, 1985; GCR list, no QSLs for any of the awards; 5 IRCs fee for each: 5BABR (5 bands Brazil), 5BAEU (Europe), 5BAAS (Asia), 5BAAF (Africa), 5BAAM (Americas), and 5BAOC (Oceanie).

5BABR. Work three Brazilian QSOs (at least two different states) per band (same bands plus 80 or 160) for 15 QSLs total, two of which must be PPC members.

For each of the other 5 awards: Work three QSOs per band (same five bands) with at least two different countries of the specific continent on each band, plus one QSL with a PPC member, for 16 QSLs.

Request awards from: PPC Awards Manager, PO Box 18003 Rio, Rio de Janeiro 20720 Brazil.

Locator System Awards

The PPC group is also working on the IARU World Locator system, and has two new awards, the PYLOC and the PPPY1.

PYLOC. Work Brazilian amateur stations employing the IARU locator system, six-digit locator on site shown as prime QTH on their licenses. (Temporary allowance is made for use of geographical coordinates until locator system is completed.) A station may operate from a site other than its prime QTH; portables must clearly show LOC corresponding to site.

QSL valid from January 1, 1986. Initial series of 100 LOC (subsquares spread over at least five Fields; followed by four series of 25 LOC each and one additional Field each, minimum. GCR, no QSLs, 5 IRCs to PPC Certificate Manager at the same address as the Awards Manager, a few lines above.

PPPY1. Like PYLOC but QSLs from operators within the states of Espirito Santo (PP1) and Rio de Janeiro (PY1). Initial series of 50 LOC spread in at least two squares, followed by four series of 15 subsquares each, and one additional square each, minimum. GCR, no QSLs, 5 IRCs to Certificate Manager.

The Carioca Woodpeckers Group is preparing QTH Locators for all its members, and computer programs are doing a fine job although accurate coordinates are not easy to find for some members living far from main centers.

If you are interested in knowing all of the 28 PPC awards, send an SASE and one IRC to the address of the Certificate Manager.

And, by the way, this year's WWSA CW Test was very, very good. We are planning plenty of first class modifications so friends will find still better conditions to face 1988's World Wide South America CW Contest!

ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev M.P.O. 85530
Israel

POSTAGE STAMP HONORS AMATEUR RADIO

On June 14, the Israel Post Office issued a stamp valued at 2.50 Shekels [*US $1.55 on 7/28 - Ed.*] honoring radio amateurs. Along with the stamp and first-day covers bearing the insignia of the Israel Amateur Radio Club, was distributed a pamphlet out lining the history of amateur radio in the country, its significance in communications emergencies, and as a technically enriching activity.

Behind the scenes, Mark Stern 4Z4KX, IARC Awards Manager and collector of amateur radio postage stamps, had been lobbying the Post Office Philatelic Service for years to issue a ham radio stamp. Mark's persistence at last bore fruit and with excitement he announced to us that in time for the IARC's 40th birthday the postal authorities would put out the stamp.

In a special ceremony on the first day of issue, in which Mark, representatives of the IARC, and the Ministry of Communications took part, the stamp and first-day cover were presented along with many speeches praising the public service record of the amateur radio community in Israel. Officials from the Ministry said that they would work to preserve the interests of the amateurs in international conferences. Thus, the worldwide family of hams can count on one more country to cast its vote in favor of preserving the ham bands.

The IARC has purchased a quantity of first-day covers of the stamp, and these will be available on a first-come, first-serve basis. Those interested should send a check—which will cover all costs—for US $5.00, payable to the Israel Amateur Radio Club for each first-day cover desired. Mail

to IARC Stamp, POB 4099, 61040 Tel-Aviv, Israel.

IARC ANNUAL ASSEMBLY

The end of June saw the membership of the IARC convene in Tel-Aviv to elect new officers for the coming year, discuss Club policy, issue awards of merit, and get together for an opportunity for eyeball QSOs.

Speaking for the Ministry of Communications, Mr. Alon Bar-Sela 4X1AB announced that Sweden, Australia, and Paraguay have signed reciprocal licensing agreements with Israel and negotiations are going on with two other countries. He also said that the Israeli representatives to the upcoming international conference on the mobile radio service had been instructed to vote in the interests of the amateur radio service.

Amongst the recipients of certificates of special merit, Shimon Kushnir XE1GGU is of special note to our readers. During the Mexican earthquake disaster, Shimon single-handedly formed the Mexican end of a round-the-clock link that originated thousands of health and welfare messages to relatives and concerned parties in Israel.

INFORMATION NEEDED

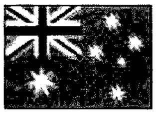
Many hams in Israel and all over the world received certificates from the Amateur Radio Association of Mexico in recognition of their work during the Mexico calamity. Shimon is compiling a book on the traffic-handling activity between Israel and Mexico during that period and will be greatly appreciative of any information you may have on the matter, personal stories, newspaper clippings, etc. Please address to Shimon Kushnir XE1GGU, Monte Chimborazo 580-402, Mexico City 10 D.F., Mexico.

HAMS GIVE EXAMS

For the first time, the Ministry of Communications' amateur radio examinations for all three classes of licenses were administered by volunteers of the IARC, under Ministry supervision. The Club is working on a bank of multiple-choice questions that will speed up marking; and exams are being held four times a year now instead of twice because of the added volunteer manpower. More and more youngsters are being heard on the air—an encouraging sign when in many countries hams are bewailing the lack of new blood.

The 2.50 Shekel stamp honoring amateur radio. This is from the bottom strip of a page of stamps. "Israel Radio Amateurs" appears on the stamp in Hebrew. The first-day cover has the words in both English and Hebrew, and the special cancellation includes the IARC logo.

XE1GGU (left) receives a plaque and certificate from Rami Shlain 4Z4LX for his Mexico disaster emergency work.



NORFOLK ISLAND

Kirsti Jenkins-Smith VK9NL
PO Box 90
Norfolk Island 2899
Australia

ISLAND INVADED

Modern times continue to catch up with us here. One year ago it was decided that we should not have TV on the Island due to the high cost involved. But recently, out of the blue, a gentleman came along who set about to show us what we were missing. He conducted TV tests for one week by picking up the AUSSAT satellite TV channel with a dish antenna on the Island's 900-foot-high Mt. Pitt and retransmitting the signal for all and sundry to receive in their living rooms.

Needless to say, this exercise whet the appetite. A petition was signed by enough people to put pressure on the local government, and, *hey, presto!* From August 1987, the radio amateurs on Norfolk Island had to start reading up on TVI!

In a way it is the end of an era. Until now we have been able to skip whole chapters of radio handbooks and lengthy articles in many publications. But now our unconcerned freedom from TVI has ended. Of course, there has been the odd claim of VCR interference. VCR has been around for years and some of the hire tapes are badly copied, with squiggles and lines. It became popular a few years ago to blame the poor quality on amateur radio. There was even dire talk of having amateur radio banned as "a public nuisance," but this was never put to the test. During a period of low activity, ham-radio-wise, while Jim and I were both off the Island, the squiggles and lines remained, and perhaps the penny dropped. In any case, people began to understand that copies of tapes which have been viewed so many times that they have become just about transparent do not make for crystal-clear VCR performance.

TVI Teapot Tempest

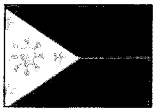
Norfolk Island comes under Australian laws regarding communications and related matters. In recent times, the Government introduced a new law governing standards of electronic equipment. In theory, it is an offense to sell, buy, or own a substandard piece of equipment which does not satisfactorily reject rf. It is doubtful that this law was made for the benefit of amateur radio. It was more likely a means to combat people picking up signals from other and more sensitive transmissions on their toasters, electronic organs, VCR, etc. However, it is to be hoped that in the long run the law will also benefit amateur radio, so that when the neighbour who owns a little radio built into a teapot or ashtray complains of interference, the average amateur will have a leg to stand on, and won't have to transform a two-bob radio into a legally acceptable receiver just to keep the peace.

The potential TVI problem is something else. In the normal manner of resident operators, houses on the Island have enough distance between them for this not to be an unbeatable obstacle. But visiting hams who want to operate from their hotel rooms may meet some objections. Hotels and holiday apartments will have television sets installed in all rooms.

TVI will raise its ugly head the way it does in cities of apartment blocks. Unless, of course, the average tourist continues to appreciate the freedom from TV, the getting-away-from-it-all, which up to now has been one of the slogans used for attracting visitors to the Island, may have to be reconsidered. Time will show.

HAM POPULATION UP 14%!

Meanwhile, the resident amateur radio population has increased. Phil VK9NP is active on all bands including 160. He operates SSB, RTTY, and some CW. QSL Phil direct to PO Box 39, Norfolk Island 2889, Australia. Being employed on the Island, Phil should be with us for some time to come. By joining us, he has swelled the number of licensed amateurs on Norfolk Island to eight.



PHILIPPINES

Leo M. Almazan WA6LOS/DU2
10098 Knight Drive
San Diego CA 92126

Hello, again, everyone. It's been a year since I wrote last for the International Column. I am now working at the Naval Ocean Systems Center here in San Diego in one of the premier R&D labs of the Department of the Navy. My projects, however, will provide me an opportunity to travel to both Clark Air Force Base and Subic Naval Base, in DU-land, at least twice a year, so I still will continue to provide interesting write-ups on amateur radio activities there with the help of a lot of my DU and portable DU friends.

CHANGES

A lot has happened in the Philippines since my last article last year. Of course, everyone by now has heard of the "peaceful" revolution that occurred February, last year. With the demise of the Marcos regime also came sweeping changes in the whole administrative structure of the government.

The National Telecommunications Commission has a new commissioner. Commissioner Sy has replaced Brigadier General (Ret.) Carreon. Rumor has it that the redistricting of amateur call prefixes will be in parallel with the current political districts.

DU1 will stay as is, but DU2 to DU9 will change: DU2 (and /DU2, Clark AFB and Subic NB) will be DU3s, which was the Mountain Province district. Most of the grumbling probably will come from DU6 to DU9, where the ham population is next only to DU1 in terms of numbers.

REVOLUTION

The February Revolution of 86 will always be remembered in the history of amateur radio in the Philippines. Hams all over the country provided almost all the primary and secondary communications during the revolution. When the revolutionary radio station, Radio Veritas, was bombed by the Marcos loyalist force, an Army major from the revolutionary force called Joe Mari Gonzales DU1JMG for help, knowing that Joe had a powerful set-up at his home QTH. Joe, always the consummate ham, accepted the request knowing full well the consequences of the action he was about to undertake.

DU1JMG, using his station on 40 meters, received news and information via landline or from two-meter stations in the revolutionary camps, and broadcast this information on 7.045 MHz. A secret standard broadcast station in Metro Manila, using a phony callsign, and many other commercial stations in Visayas and Mindanao picked up the broadcast and rebroadcast it from their stations to everyone's delight and the Marcos' chagrin.

This was important because of the news blackout during the first two days of the revolution. And from all indications, DU1JMG's broadcast was heard all over Asia, the Pacific, and on the west coast of the United States!

A threatening call from one of the Marcos's generals to DU1JMG made the whole thing verrrrry interesting indeed! (DU1JMG, for your information, is alive and well...)

Well, this is it for now. By the way, I am writing—or should I say, typing—this article on a lap-top computer by Data General, somewhere in the North Pacific Ocean, aboard a Navy cruiser. Nothing else to do aboard a ship if you are a civilian. I really admire these sailors who have to stay aboard this tin can for six months. Me, I'm out of here in two days.

Good DX, and 73.■

PROPAGATION

Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U.S.S.R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.
NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

October is the fall contest month and will provide good DX conditions on more than half of the days. However, it looks as if the weekends may not be as uniformly good as hoped for. The first, second and third weekends of the month look to be sub-standard on the HF bands, while the last two weekends appear to be about normal for this time of year. Daylight hours are getting shorter and the HF bands are expected to close even earlier in the evening than last month. Propagation on 40 and 75/80 meters will continually improve. For those of you who operate 30 meters, Europe will be coming through in the late afternoon and early evening. Keep looking for good grey-line DX conditions in the mornings around sunrise when VK-ZL and other Pacific stations ought to be heard clearly.

OCTOBER

SUN	MON	TUE	WED	THU	FRI	SAT
				1 G	2 G–F	3 P
4 F–G	5 G	6 G–F	7 F–P	8 P	9 P	10 P–F
11 F	12 G	13 G	14 G	15 G–F	16 F–P	17 P
18 P	19 P	20 P	21 P	22 P–F	23 F	24 G
25 G	26 G	27 G	28 G	29 G	30 G	31 G

NOVEMBER 1987
Issue #326

73 Amateur Radio

USA $2.95
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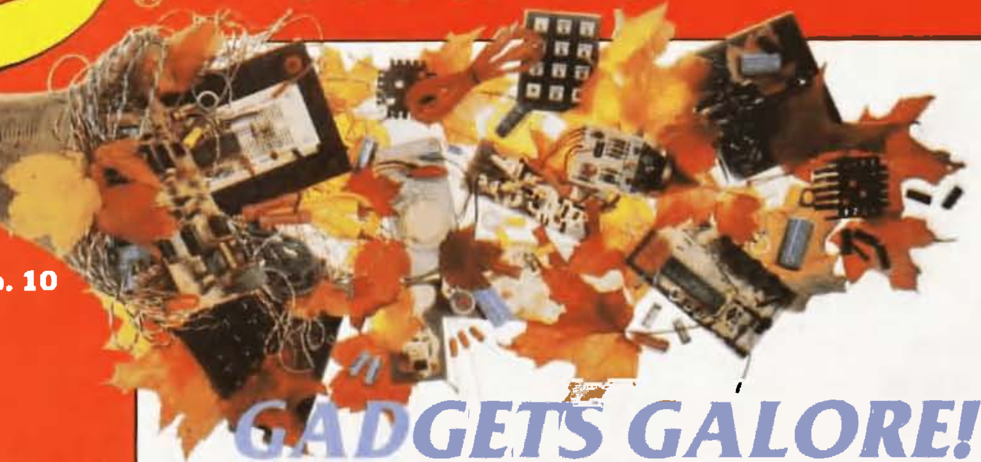

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GADGETS GALORE!

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NEVER SAY DIE

Wayne Green

QUALITY CONTACTS

Are a large percentage of your contacts with turkeys? Worse, are the guys you're working thinking exactly the same thing? Well, it's been a while since I've written about how to make your contacts more interesting, so perhaps you've forgotten—or, worse, weren't paying attention in the first place.

How many chaps go out of their way to tell you how much they've enjoyed a contact with you as you're signing off? Haven't heard that for a while, eh? I thought not. Well, there's a secret to making contacts fun for the other chap—and for yourself. Once you know what it is, you'll seldom have a dull contact—at least for the chaps you're working—and probably not for you either.

All of us get hung up in habits. Our basic mike (or key) fright makes it so we tend to stick to a formula contact—one which we have down pat and allows us to go on the air and make QSO after QSO without ever having to think. You may have some trauma when you first try to break this habit—after all, with the average ham nearing sixty and having been licensed for around 45 years, we're probably talking about a 45-year ingrained habit. That's one hell of a rut!

No pain, no gain, as they say, so you're going to have to put some work into this. Now don't panic—I'm not going to ask you to actually think while you're sitting there at the mike—nothing that difficult. You're going to be able to do most of the work while you're listening.

Getting Down to Basics

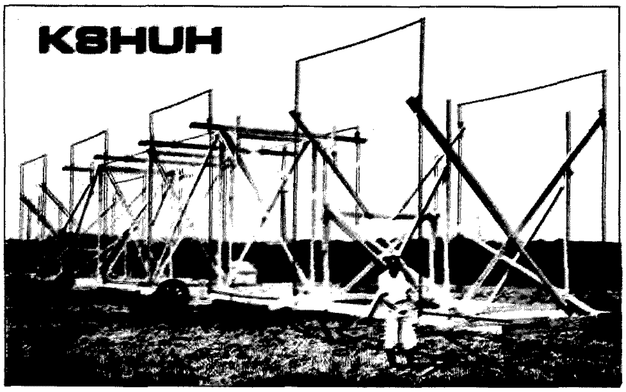
Let's start with some basics—things you know darned well you should have at hand, but have been too lazy to provide. I'm talking as basic as pencils and paper. Hey, I've visited hundreds of ham shacks—gotten on the air from them—so I know darned well you haven't got any decent paper or an actual working pencil around. Get several good pencils and keep them with leads in them. I know this goes against the grain, but buy them if your employer doesn't provide a "free" supply. Make sure they have erasers that work, too. Why you will spend thousands of dollars on your rig, antenna and tower and then chintz at something like pencils to help make all this go I don't know. But I do know this, if I happen to be in your town and I stop off at your house and ask to see your shack, I'm going to find a crummy old chewed-up pencil stub with a hard eraser that makes a mess if I get the wrong letter in a call the first time—one with a nub of a point which I have to turn just the right way to make a mark. Get some cheap mechanical pencils.

Paper. Hey, don't shove an ARRL log book at me for paper. We're going to be taking some notes during contacts from now on and they're not going to fit on one lousy line of your log book. That miserable log book is one of the worst blights in the hobby—it encourages us to make rotten QSOs. Just look at the pitiful space it leaves for comments! No, put the book in the closet or get rid of it. From now on you're going to take notes when you make a contact.

How many times have you made a contact with someone and gotten the impression that he must have at least two other people in the shack who talk with him all through your transmissions? All he does is go through his regular routine blah, with never the slightest pickup on anything you've said. From now on the chaps you talk with aren't going to get away with that baloney any more. If they're going to get on the air they're going to give good contact.

Paper—let's work with a pad of 8-1/2" x 11" paper—lined is probably better. I've seen what happens when you don't have lines to keep you on the straight and narrow. I can see panic beginning to rise—yes, you're going to use a whole sheet of paper for each contact! No more two-inch space in a log book. Not even a 3" x 5" card. No, by George, we're going first

Continued on page 18



QSL OF THE MONTH

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QRM

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Contract: The mere opening of this magazine establishes a binding legal contract between you and the publisher. Thus you are hereby directed to become a royal pain in your ham club, egging them on mercilessly to bring in youngsters and get them Noviced. Neither rain nor a sudden DXpedition surfacing on 20m shall deviate you from this course.

QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

ABC Error

Investigators from the FCC and the FBI are trying to track down a wayward radio operator who has been jamming an air traffic control frequency at New York's busy La Guardia Airport. According to several reports, the radio operator gave false landing instructions to incoming jets. A report on the Monday, August 17th, edition of ABC's "World News Tonight" identified the radio intruder as a ham radio operator, but a spokesperson for the news bureau later admitted that ABC had no proof that a ham was involved. She claims that the story was revised in a later feed to delete the ham reference, and could not explain how the original version got on the air.

Hairy Time

Hams were swift to respond to a call for emergency communications after a record 9-inch rainfall marooned Chicago's O'Hare Airport, and flooded thousands of businesses in Cook and DuPage counties on Friday, August 14th. The Northwest ARES spent the entire weekend providing communications to the outside world for the town of Roselle after the basement of the engineering complex of the local Illinois Bell switching center filled with 11 feet of water. This knocked out the system's power plant and telephone service to over 50,000 Roselle and Schaumburg customers. Humana Hospital in Hoffman Estates lost a portion of its telephone system during the storm; The Wayfar repeater made its autopatch available to the hospital. It was used for both internal and external communications.

Salt Creek in East DuPage county overflowed its banks causing the activation of the DuPage ARES, operating under the direction of the Du Page Emergency Services Disaster Administration. They used the facilities of the WCRA Repeater for the entire weekend for emergency-related incidents. The Elk Grove ARC, which is affiliated with the local Civil Defense organization, assisted the fire and police departments in linking the Elk Grove Village Hall, whose basement was completely flooded, to the rest of the community via the KB9L Repeater.

Compliments to the many Chicago area hams who pitched in and helped provide emergency communications.

O Canada

The Canadian DOC announced that effective July 29th, Canadian amateurs may operate on the 17m (18.068–18.168 MHz) and 12m (24.890–24.990 MHz) bands. CW, voice, and FSK, are permitted across the full 100 kHz of each band. All emissions must have a maximum bandwidth of 6 kHz.

Holders of Amateur Operators Certificates may use F1 or A1 emissions only on the new bands.

$12,000 for Ham Ed

New York City children may soon learn ham in the classroom. An outstanding group of NYC ham educators—Joe Fairclough WB2JKJ at Junior High School #22 in Manhattan; 1987 Ham of the Year Carole Perry WB2MGP, of the Rocco Laurie School on Staten Island; Ron Lulov KD2LA, who has a program which ties amateur radio in with the Junior Astronauts; Martin Smith KA2NRR, Assistant Director for guidance services in the Office of Student Progress in NYC; and others—a year ago formed a group called The Council for the Advancement of Amateur Radio in the New York City Schools. This group expanded rapidly, and the need grew to standardize the teaching of ham radio in schools. They recently met with the Division of Curriculum and Instruction and the Media Telecommunications Unit and obtained a commitment for $12,000 to write a curriculum on amateur radio to be taught in NYC schools.

According to KA2NRR, "the curricular approach will reach all grades. A curriculum will help insure the continuation of a ham program in a school even after its founder is gone. This way, even a non-ham teacher can be showm how to teach it.

"Once we get the curriculum written, it will be piloted in six schools; two Elementary, two Junior High, and two High Schools."

Smith clearly sees the importance of exposing young people to ham radio. He says: ". . . since I am in guidance, one of the things that concerns me is the career implications for the future . . . if kids are 'turned on' to amateur radio early enough, many will go into engineering, computer, or science fields where we badly need people. I think that the ham radio approach is a great way to move in that direction."

The smokestack-shaped structure on the car roof is the first mobile antenna, invented by Guglielmo Marconi in 1897. It was soon replaced by the more modern "clothesline" antenna (so named because it looked like six lengths of clothesline strung between poles at the front and back of the car). The familiar whip antenna came on the scene only in 1937.

Oops!

Readers have called to our attention several omissions in the September Antenna issue. The first is in the Letters department in the letter titled "Oversight"; the article "Death on the Rails" is in the April '87 issue of *Firehouse*. In the article "HF Half-Sloper", the 160-m coil takes 107 turns of #16 enameled wire, and the 80-m coil takes 60 turns of #16 enameled wire. *73* apologizes for these oversights.

Bagged Mag

Tired of carefully peeling off the mailing label to read the Table of Contents? Sick of having your magazine subjected to the vagaries of the weather and Postal Service? Starting with the December issue, *73* subscribers will receive their magazine in protective poly-bags.

Circuits!

***73 Magazine* is reinstating its Circuits column** in the December issue, after a three-year hiatus. Share your circuit with the ham community and earn a year's subscription to *73* (subscribers will have their subscription extended by a year).

Finis

Keep your news items rolling in. Items for this month's column are courtesy of *Westlink*, *London Times*, *Chatter Bug*, *Designfax*, and the *ARRL Newsletter*.

LETTERS

BRASS BANGER BROTHERHOOD

So what do I want out of amateur radio? I want 2 meter and 440. Why do I want the local stuff? Okay, I'm too cheap to shell out a kilobuck up front and a hectobuck a month for a mobile phone just so I can call the highway patrol when I see someone in trouble on the road.

If it weren't for the close-knit amateur community where I work, I wouldn't even be going for a ticket. It's because of the encouragement of four folks in the amateur club who are taking time out of their busy schedules to teach a class after hours that I'm even trying. One of the big lures is the open 440 repeater on top of the building.

So it's up to all of us who have the knowledge to turn others onto the brotherhood that exists between us brass bangers. If you just spend your time DXing on the advanced bands, you're gonna run out of contacts unless you help novices work their way up. I don't have the time to get involved in any community emergency work, but you can bet your carrier I'm gonna spread the word of how amateur radio can make this a better world for all of us.

It's the people like you (Wayne) who'll keep the rest of us interested in the hobby. In fact, it was you who got me building an IMSAI in 1975, which this letter was written on.

Ronald M. LaPedis
Daly City CA

KUDOS

I have enjoyed the improvement in the magazine since you (Wayne) have returned and look forward to more great articles.

John G. Boles KA6LWC
San Jose CA

EXTRA

Yes, I'm an Extra with one of those funny calls as W2NSD calls them. Perhaps Extras are crazy from the code. Perhaps the old saying, "You don't have to be crazy to work here, but it sure helps," can be applied to contesting, high-speed CW, chasing DX, or maybe I should say any form of amateur radio operating. Myself, I don't care if I'm labeled crazy. I thoroughly enjoy operating and also teaching amateur radio classes. Amateur radio is my hobby that doesn't provide any barriers that I've come across that I can't overcome. Hell, I had to try to master 26 WPM CW to make me crazy and obtain that funny call, and I did it! I'm proud of my 2 x 1 call and feel honored to be labeled crazy.

Jim Buikema NR9G
Morrison IL

HONEYDITION?

Wayne, if you truly want to aid the ham community I have some challenges for you: Both *73* and QST do a poor job in an area that represents half the world population and which controls some 70% of the money. Yes, I'm talking about the YL/XYL world. QST is a little better with their YL column, but in fact we are still guilty of male chauvinism.

YL/XYLs care more about appearance than do OMs. I'm referring to rigs, operating desk, and outdoor antennas. Consider the possibility of ten dB trees, his 'n' her rigs, packet palm trees. How about a *73* 2-meter marriage offer—get married via repeater and win a paid DX honeydition to Antigua.

The potential to double the US ham population is more real than the controversy, and divisiveness of the code/no-code issue.

Bernie Coler KC7CP
Corvallis OR

NTS NOTES

You finally got me with your invitation to comment on the ARRL National Traffic System in your *73* piece of April. Of course, the traffic could be better handled by packet, and some of it probably will be. ARRL could force this to some extent by only making Brass Pounders League certificates available to traffic handlers who use packet, and only listing packet traffic totals at the end of section news columns in QST each month. I personally wish this would happen so that the ARRL would no longer have any excuse for not giving phone contester and DXers (like myself) the use of SSB between 7075 and 7100 kHz, so we wouldn't have to work crossband on 40 meter phone to work the DX anymore. You recall that the ARRL board was about ready to propose this to the FCC at one point when the CW traffic hounds in the so-called Transcontinental Corps protested that these were their frequencies. So much mail flowed in to the Directors that they quickly backed away form their proposal.

The plain and sad truth is that you are one of the few old timers around who is willing to consider new ways of doing things.

Nets also provide satisfaction to the busybodies and would-be dictators in our ranks. Woe onto the check-in who fails to get his preamble exactly right!

The Mexico earthquake shocked a number of traffic hounds by proving that the NTS was practically useless in such a situation. Far from depending on organized nets, the success of the operation depended on the ad hoc common sense of many amateurs who adapted their operation to the objective requirements of the moment, which did not include the use of organized nets or the ability to use the standard preamble. The fact is, the Mexican earthquake operation was a model of efficiency, and it broke all of the NTS rules at the same time. This was a pretty hard reality for a lot of the regular traffic handlers to swallow! Many of the most successful participants were DXers and contesters equipped for 20 meters where the operation took place, and they were more accustomed to dragging signals through QRM. Since almost all operation was on SSB, it did little good to be a hotshot CW brasspounder, either. And, finally, nobody had time to worry about a proper preamble. A number was good enough.

I should pause to give credit to nets like the Intercontinental Traffic Net here. At least their daily operations are much closer to the type of operation needed during a massive earthquake. They do not require that check-ins stick to formal traffic forms. But their regular check-ins are not usually the ones getting ARRL Brasspounder League awards, either. Finally, it turned out to be very useful to speak English. And

Continued on page 45

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Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0745-080X) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

The DM-4061 Dip Meter

Electronic Equipment Bank
516 Mill St. NE
Vienna VA 22180
Price Class: $90

A simple device offers a multitude of data.

by Bill Clarke WA4BLC

"Education consists mainly in what we have unlearned"

Mark Twain

Long ago, when hams built most of their equipment, almost every one had a small, multipurpose tool. It was used for testing and aligning tuned circuits, tuning receivers, measuring frequency outputs, checking for harmonics, plus designing and testing antennas. The device was not large. It could even be held in the palm of the hand. What was it? The grid dip oscillator—generally referred to as a dipper.

Now that we live in the world of transistors, there are no grids to dip. So, the modern version of the grid dip oscillator is the dip oscillator. The principles of operation are the same. Recently, I obtained an EEB Model DM-4061 Dip Meter (oscillator), and was so impressed that I felt I should spread the word. Actually, I had been looking for a used dipper at the local hamfests, but to no avail. Then I was out at EEB (Electronic Equipment Bank of Vienna, Virginia) and saw a brand-new one for an affordable price of $90.

I can't say the packaging is impressive, nor was the plain wrapper, but when I opened the unit to install the nine-volt battery, I was impressed. The mechanical design and layout of this piece of equipment will allow it to operate in a stable manner and prevent damage if it receives a little rough treatment. The single weak point is the plug-in coils, which are fragile and exposed, thus easily broken. This tends to be the same problem for all grid-dip oscillators and dip oscillators.

After I put the cover back on the dipper, I turned it on and listened for the oscillator signal on my Kenwood TS-430. Sure enough, there it was, and right where the color-coded dial said it would be. The frequency tuning dial on the dipper is color-coded to correspond with the color coding of the plug-in coils.

Like all new toys, I went right to work using the dipper. Since it put out such a nice signal, I decided to put it to work and align my Drake TR-3. I opened my service manual for the Drake to check what frequency I should set the dipper for, and proceeded to align the receiver section as instructed. For HF receivers, the dipper puts out a stable signal, ideal for the purpose of receiver alignment.

Tuned Circuits

Next I did some sniffing around in my linear amplifier project. Sniffing? That's what it's called when you probe around the inside of electronic equipment with a test device.

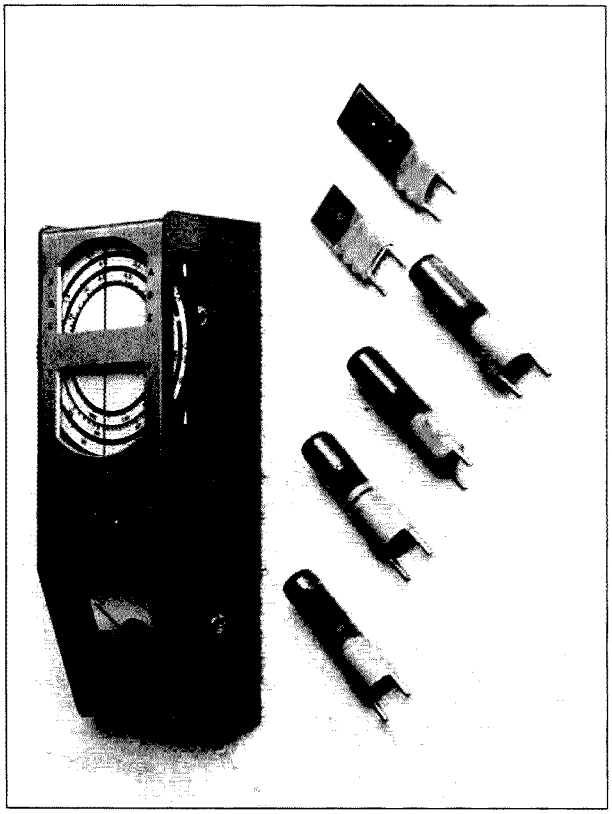


Photo A. Dip Meter with six plug-in coils.

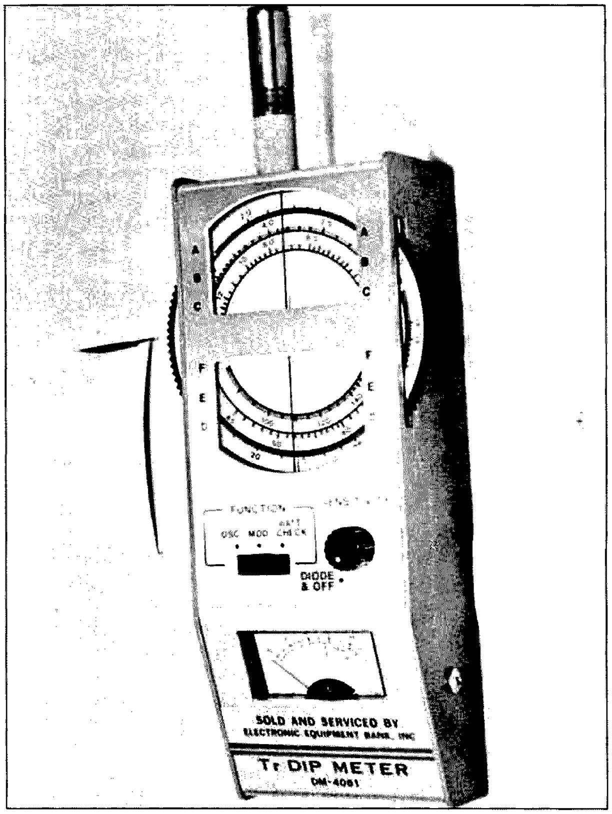


Photo B. The DM-4061 Dip Meter.

SPECIFICATIONS

Frequency Range (in six ranges):
A - 1.5 to 4.0 MHz
B - 3.3 to 8.0 MHz
C - 6.8 to 18 MHz
D - 18 to 47 MHz
E - 45 to 110 MHz
F - 100 to 250 MHz
Modulation: 2 kHz
Xtal Oscillator: 1–15 MHz (must be in FT-243 holder)
Power Supply: 9-volt internal battery
Consumption: 2 mA maximum
Solid State Devices: 2 transistors and 1 diode
Dimensions: 6-7/8" x 2-9/16" x 2.0"
Weight: 1.1 lbs.

CONTROLS

Main Tuning: frequency dial with six color coded bands corresponding to the coil in use.
Functions: OSC—dip meter or absorption meter
MOD—2 kHz modulation added to carrier
BATT—checks battery
Sensitivity: on/off and oscillator output level
Meter: 100 mA movement
Earphone Jack: for monitoring AM signals

Seems I was having a little problem in getting the tuned input circuits set up.

I began by plugging in the B coil (3.3 to 8.0 MHz) and advancing the sensitivity control until .8 registered on the dipper's meter. Then I moved the coil close to the tuned input circuit and slowly rotated the frequency dial until I saw the meter dip. I checked the frequency on the orange scale of the dial—it read 2.9 MHz. Using a non-conductive tuning wand, I proceeded to make adjustments to the coil in the tuned ciruit. After moving the coil slug, I again checked for dip. The first time I found the dip at 3.5 MHz, the second I got on the money—3.8 MHz. Quite handy indeed. The dipper saved me a lot of time and kept me from tuning the inputs with the amp working.

I had never completed hooking up all the taps on the final plate coil of my amplifier, so I used the dipper to determine proper tapping of the plate coil.

The dipper's meter showed .8, and I placed the plug-in coil near the plate coil and turned the frequency dial until I got an indication (a dip). I read the dial frequency, and then moved the tap as necessary to change the resonant frequency. Tap for more coil to lower the frequency of resonance, less coil to raise it. Don't forget that the capacitor settings will vary the resonant frequency considerably.

After checking each band's input, retuning all of them, and making the necessary coil taps on the plate coil, I warmed up the amp. It was time to check operation.

Once I verified operation of the amp (in other words it amplified), I checked for parasitics in the final section. I turned the dipper off and set the function switch to OSC, then keyed the transmitter and amplifier. Using the plug-in coil as a sniffer, I placed it near the output of the final stage. Then, tuning the frequency dial, I looked for indications of output. Naturally, there was an indication at the carrier frequency, and fortunately none of any significance at any other frequency.

Testing

Now that the amp was ready, I thought it would be good to check out the antenna. I used a set of dipoles on a single feedline for 160, 75, and 40 meters. I constructed a small loop of wire, about an inch in diameter, and attached it to the shack end of the coax line. Then I turned the dipper on and set the function to OSC. I placed the sniffer coil inside the loop and turned the frequency dial. I found peaks at 1.9 MHz, 3.9 MHz, and 7.2 MHz—just where they were supposed to be.

There are many other uses for the dipper. Among these are: testing antenna traps, adjusting antenna tuners, making feedline adjustments, setting mobile HF antennas, testing tuned circuits in receivers and transmitters, or checking just about anything that can be considered tuned. You can even test crystals.

Although the dipper performed quite well at HF frequencies, it fell off in the VHF range. However, this should not be discouraging. Generally, the only test equipment that works well in the VHF region costs lots of bucks and is quite sophisticated. For general HF ham usage I think the EEB Dip Meter is well worth having. ■

Jon Enoch VE7JON
S-11, C-69 RR#1
Kelowna, B.C.
Canada V1Y 7P9

The Tesla High Frequency Transformer

A unique demonstration of electrical resonance for the experienced hobbyist.

The spark-excited Tesla high-frequency transformer provides a display that leaves most first-time observers wide-eyed and speechless. Although it won't find too much use in the hamshack, it provides such an awesome demonstration of electrical resonance that one would make an ideal ham club project. The working of a transformer offers a unique visual aid for teaching a new ham candidate resonant circuit theory as he observes a crackling eighteen-inch spark discharge itself into the air.

Just to refresh your memory, a Tesla is a unit of magnetic flux. My first coil was built around a commercially available neon sign transformer. These units are usually rated around 30 to 120 mA and come in various voltages. A 7500 to 15000 volt unit is perfect for a 30-inch coil and will produce a corona anywhere from 12 to 20 inches in length. These transformers can usually be found at scrap metal yards or pulled from discarded furnaces. Mine was a surplus unit given to me by a local ham. Referring to Figure 1, the Tesla's secondary may be considered a transmission line of ¼ wavelength. As the capacitors (A) are charged by the neon transformer's secondary (B) their voltage breaks down the spark gap (C) causing the capacitors to discharge through the Tesla's primary in an oscillatory fashion. The Tesla secondary is made resonant with the primary so that the excited primary causes the secondary to oscillate in resonance. This in turn generates a high voltage with sufficient magnitude to cause a corona spark discharge at the secondary's top electrode (D).

Construction

After you have acquired the transformer, begin work on the Tesla secondary. Locate a 30-inch length of PVC (or similar material) sewer pipe about 6 inches in diameter. This material must have good dielectric properties. Beware of materials that could melt or carbonize due to arcing. The pipe should then be taken to a shop or fellow amateur who is equipped with a lathe since the tube must now be trued and threaded its full length with 20 shallow threads per inch. These grooves will serve to hold the secondary winding which is wound with one continuous length of #26 or #28 cotton or enameled wire. Ideally, this winding would be applied while the tube is still on the lathe, while the operator feeds the wire from a spool onto the grooves. In my case, I rigged up a small motor with a reduction gear to rotate the tube while I applied the winding. This was necessary since my tube was turned on a lathe out of town.

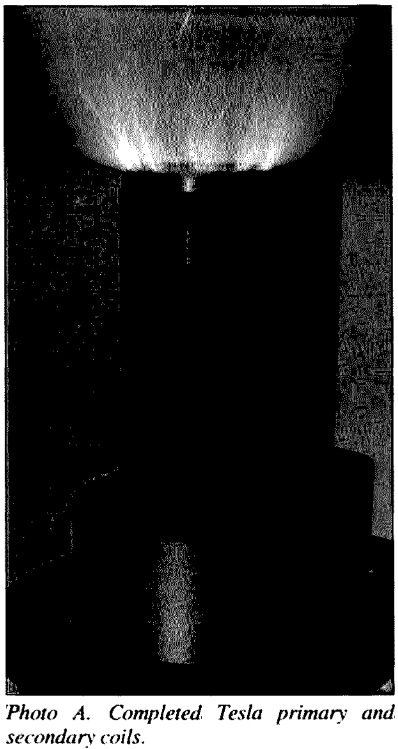


Photo A. Completed Tesla primary and secondary coils.

After the winding is completed the entire coil is given 3 or 4 coats of shellac and allowed to dry between coats. This prevents arcing between adjacent windings. A 6-inch gong from an electric bell or, as in my case, an aluminum ashtray, make a good top electrode. Drill a small hole in one end of the secondary and pass the last few inches of the winding through the hole to the inside of the tube, where it is soldered to the underside of the top electrode. The electrode is then glued with silicone seal to the top of the secondary's form. The Tesla secondary is now complete.

The Tesla primary consists of approximately 8 turns of #6 gauge copper ground wire which is commonly available at most hardware stores. About 40 feet will be needed for our purposes. This wire is wound onto a wooden form, the construction of which I will now describe.

Begin construction by cutting two identical wooden rings from a ¼ sheet of ¾ inch plywood. The outside diameter of these rings measures 18 inches, while the inside diameter measures 11 inches—thus the width of any given part of the ring is 3½ inches. I cut my rings with a common hand sabre saw. When both rings are completed, place one atop the other and temporarily screw them together in alignment.

Next, mark and drill twelve ½ inch holes through both rings at 1¾ inch centers from the outer ring edge. These holes are equally spaced around the rings (see Figure 2). Now cut twelve 1-foot lengths of ½ inch diameter wooden dowel. When this job is finished, insert the 12 lengths into the holes previously drilled into one of the rings. You will now have one ring forming the base of a cage with 12 rods sticking up into the air. Now place the second ring on top of the form and gently tap the top ring into place with a mallet. White wood glue should be used on all dowel ends. You should now have a kind of round wooden cage on which you will wind the primary coil. When the woodworking is complete, give the entire assembly 2 or 3 coats of shellac, allow-

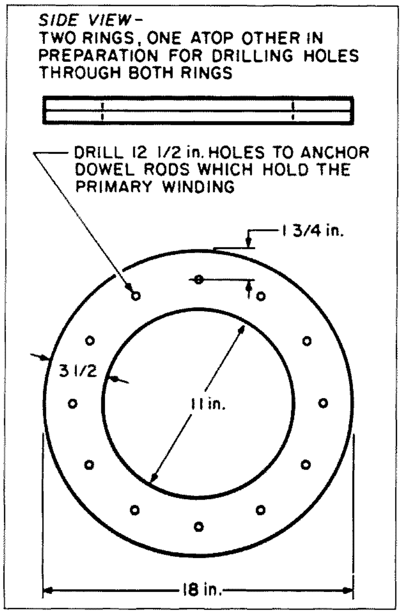


Fig. 1. Circuitry for the Tesla high-frequency tranformer.

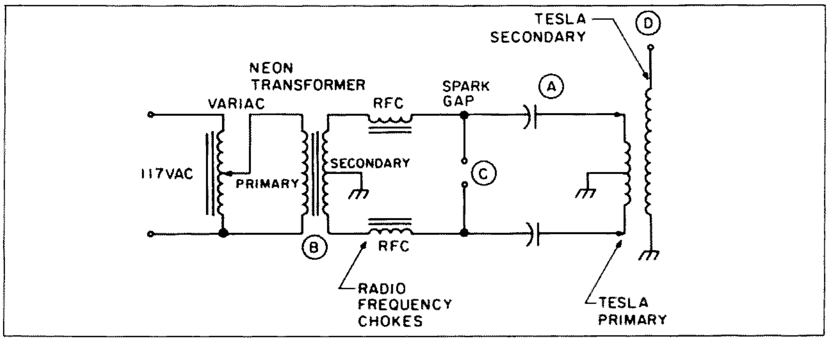


Fig. 2. Construction diagram for the Tesla high-frequency transformer.

ing each coat to dry before applying the next. Now take the length of #6 copper wire and wind onto the wooden form about 8 or 9 turns spaced about 1 inch between windings.

If the windings are applied tightly, the coil will stay put without any coaxing; however, if loosely applied, you will probably need to tape the windings into place with electrical tape. I don't really recommend the latter procedure. I anchored each end of the primary with plastic tie-wraps. Alligator clips will be used later to apply power to the primary because they are easy to adjust when tuning the tesla tranformer. With the completion of the primary, you are now 90% home!

Circuit Details

Depending on the rating of the transformer you use to furnish the power, you will need to do a little figuring in order to find the required capacity value. First, divide the transformer's secondary voltage by the power rating. For example, my transformer secondary was rated at 7500 volts @ 30 mA, thus E/I implies an impedance of 250,000 Ohms. You will need to plug this value into the following formula to find the capacitor's value:

$$C = \frac{1}{2\,\text{pi} \times F \times R}$$

Where C equals capacity in farads
F equals Frequency (60 Hz)
R equals impedance (from the former calculation)

My circuit required a capacity of .01 uF. Because neon transformers have a center tap on the secondary grounded to the case, a symmetrical primary circuit balanced to ground is required. Consequently, two .02 uF capacitors connected in series must be used to get the .01 uF value.

Capacitors must be of the high voltage type—either mica or oil-filled surplus types may be used. The operating voltage on my oil-filled types were rated at 8000 volts. You can make capacitors from glass plates covered on both sides with tinfoil. However, in some applications the heat generated may crack the glass and blow the capacitors along with the transformer. Alternatively, double sided copper clad circuit board with the outer edges etched away to prevent arcing might be another possibility. Although I have not personally gone this route, I would be more than happy to hear from anyone who has tried this method.

To keep damaging high frequency currents out of the neon transformer's secondary, where they could break down the insulation on the windings, pi wound radio frequency chokes must be used. These can also be made by winding small, empty wire spools slipped onto a spare piece of wooden dowel. Refer to the circuit diagram for placement of these chokes. A spark gap can be made from 4 parallel copper plates about 2 inches in diameter. I used two adjustable capacitors from an old transmitter. The capacitors consisted of two round metal disks which could be adjusted for spacing. I used two of these capacitors in series to form my spark gap. It functions very well. A method of adjusting the gap size is required to trim the frequency during tuning up of the tesla coil.

Hooking It All Up

After you have completed both primary and secondary and acquired all other parts, start hooking the Tesla coil together. Find a spot where the coil will not be disturbed—my Tesla coil is permanently installed in my basement, away from the probing hands of my two year old daughter. A few words of warning are in order here: The voltage you are about to work with here is very dangerous. Be extremely careful. A neon sign transformer with a secondary rated at 15,000 volts at 120 mA could easily provide a fatal shock.

Place the primary on some non-conducting material. My coil sits on top of a table covered with formica. Next, place the secondary in the center of the primary. The bottom end of the secondary and the midpoint of the primary are connected together. This point is also connected to the case of the neon sign transformer. Connect the two radio frequency chokes to each side of the neon transformer's secondary, the other end of the chokes connect to the spark gap. The capacitors are then connected in series with the Tesla's primary and spark gap. Check the diagram for clarity on this point.

A variac must be used to slowly bring up the power on the neon transformer's primary. Otherwise, switching the unit on to the line at

Continued on page 31

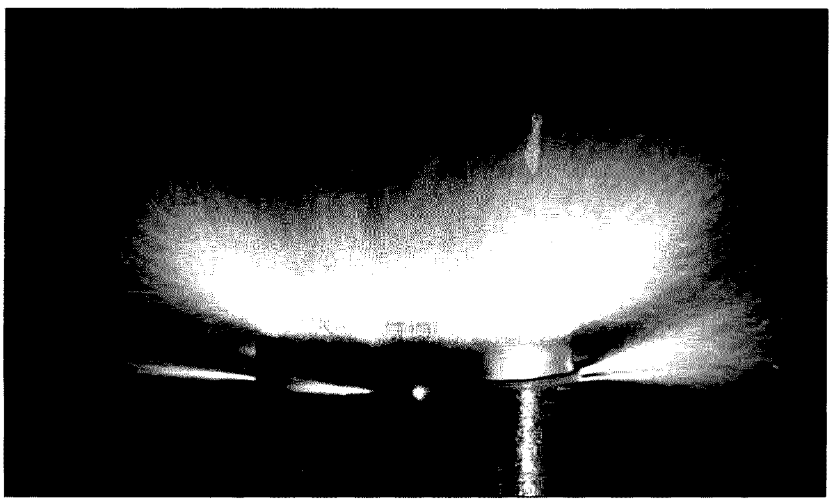


Photo B. High voltage discharge from secondary's top electrode.

James E. Taylor W2OZH
1257 Wild Flower Drive
Webster NY 14580

Signal Strength Reporting Revisited

An update on signal strength reporting

Has there ever been a measurement subject to greater abuse and ridicule than the simple process of giving our fellow hams on-the-air signal strength reports? "For practical purposes, the RST system, as practiced today, is a farce—yet it's the most common exchange between stations. Consequently, meaningless guesstimates echo endlessly through the ether," says a recent article.

A review of the history of this method can point to a solution, namely, an improved method of signal strength reporting which is both simple and qualitatively reproducible.

A Brief History

In the beginning, ham receivers didn't have S-meters. Also, they didn't have automatic gain controls so the setting of the volume control was used to provide a crude indication of signal strength. In fact the first receiver that I used (National SW-3) had nine numbers on the volume control knob for this purpose! During that era the reporting system used for radiotelephone was the QSA-R system. QSA-5, R-9 meant 100% readable and maximum signal strength.

The next improvement in the reporting of signal strength followed upon the heels of the introduction of automatic volume control (AVC, AGC) circuits. As soon as designers developed circuitry which provided an AVC voltage more or less proportional to signal strength, it was obvious that ham receivers would have a meter providing a measure of this voltage. The early signal strength meters had nine equal scale divisions so that the very strongest signals read: 9. The first new receiver that I ever bought, a Breting 14, has that type of S-meter. This was a logical system—and all that remained was for the engineers to develop a linear, decibel meter circuit.

Alas! At that point the picture became cloudy. Apparently someone (was it a marketing man?) pointed out that hams would appreciate reports of super signal strength. All that was required to achieve this (and thus ruin a rational plan) was to put the S-9 mark at the middle of the meter scale. Then all signals stronger than this would be measured in dB above S-9! In this context, the term dB has lost all logical meaning—it does not mean decibels, or anything else concrete.

If you doubt this, just turn on a linear amplifier with 10 decibels gain sometime and ask your contact to tell you what his S-meter increment was. He'll probably read 20 dB, at least! Actually, there is a standard using six-decibel S-units and defining S-9 as 50 microvolts R.M.S. across a resistance of 50 Ohms. However, this is difficult for the average ham to measure, so, over the years there has been little conformance to this or to any other standard of signal strength level. When testing the sensitivity of ten popular rigs, a range of meter readings was found at S-9 varying from 20 microvolts to 265 microvolts—a disparity of more than 20 decibels!

An Analysis

Figure 1 shows typical levels of signal strength encountered in ham radio, referred to as the standard DBM or milliwatt-decibel scale. Reading the figure from the bottom upward—first, we see (or hear) the inherent noise generated in the input circuitry of the receiver. Of course, this is dependant upon several parameters, including the bandwidth, but for our purposes, we can assume these to be fairly constant among receivers of modern design. Typically, this is the noise that we measure if we place a fifty-Ohm resistance across the antenna terminals of the receiver. For practical purposes, a one-femtowatt signal (10-15 watts) would be a barely perceptible signal, whereas, a 100 nanowatt (10-7 watts) level would be extremely strong. We still disregard any readings stronger than this (see Figure 1).

Figure 2 follows directly from Figure 1. Here, we have eliminated some unnecessary

DBM	PWR WATTS	PWR	VOLTS (50 OHMS)	REMARKS
0	1e-3	1MW	2.24e-1	
-10	1e-4	100uW	7.07e-2	
-20	1e-5	10uW	2.24e-2	
-30	1e-6	1uW	7.07e-3	
-40	1e-7	100NW	2.24e-3	EXTREMELY STRONG SIGNAL
-50	1e-8	10NW	7.07e-4	
-60	1e-9	1NW	2.24e-4	
-70	1e-10	100PW	7.07e-5	
-73	5e-11	50PW	50.0e-6	CONVENTIONAL STANDARD "S-9"
-80	1e-11	10PW	2.24e-5	
-90	1e-12	1PW	7.07e-6	
-100	1e-13	100FW	2.24e-6	
-110	1e-14	10FW	7.07e-7	
-120	1e-15	1FW	2.24e-7	FAINT SIGNAL-- BARELY READABLE
	0	//////////////////		RECEIVER BACKGROUND NOISE

Fig. 1. Typical levels of signal strength.

DBM	DBNS	NS-UNITS	REMARKS
-40	90	9	"EXTREMELY STRONG SIGNAL"
-50	80	8	"STRONG SIGNAL"
-60	70	7	"MODERATELY STRONG SIGNAL"
-70	60	6	"GOOD SIGNAL"
(-73	57		CONVENTIONAL STANDARD "S-9")
-80	50	5	"FAIRLY GOOD SIGNAL"
-90	40	4	"FAIR SIGNAL"
-100	30	3	"WEAK SIGNAL"
-110	20	2	"VERY WEAK SIGNAL"
-120	10	1	"FAINT SIGNAL, BARELY PERCEPTABLE"
-130	0	///////	RECEIVER BACKGROUND NOISE

Fig. 2. Signal strength in the RST system.

data and we have also assumed that the faint, barely readable signal is ten decibels above the receiver background noise. In Figure 2 the labels shown under REMARKS are directly quoted from the ARRL handbook's definition of Signal Strength in the RST system. It is interesting to note that under the simple assumptions which we have made, there are just nine levels of signal strength and that these levels are neatly arranged in ten decibel steps (see Figure 2)!

I have chosen to label these "NS-Units" or, nine-steps units, to differentiate from the conventional, largely meaningless, "S-Units" which are in common use. Correspondingly, there is a "dB-NS" column which indicates signal strength in decibels above receiver noise.

Application

Now, how can we apply all of this history and theory to the typical ham radio environment?

The most rigorously exact way to measure signal strength in NS-units would involve the use of a circuit which reads linearly in decibels. The circuit gain would then be set so that the meter indication would show nine equal scale divisions of ten decibels each. The zero reading would apply when a fifty-Ohm resistance is placed across the antenna terminals to the receiver. The NS-9 reading would correspond to the strongest signals heard.

However, there is a simpler, less exact way to realize the advantages of nine-steps signal strength reporting, which does not require the use of additional circuitry.

"In the beginning . . . the setting of the volume control was used to provide a crude indication of signal strength. In fact the first receiver that I used had nine numbers on the volume control for this purpose!"

The S-meter circuits normally used in transceivers are sufficiently linear in decibels to serve our purpose and some are actually quite good in this respect. We really only have to set the calibration and zero adjustments of the S-meter so that the strongest signals read full scale and so that the meter reads zero when a fifty-Ohm resistor is placed across the antenna terminals!

If an R.F. attenuator is available the nine fiducial marks can be placed at ten-decibel intervals on the meter face. (For this purpose, a transparent overlay of Saran-Wrap or other transparent plastic can be used. Those who are a little more venturesome can usually find a meter which can be added externally in series with the regular S-meter, so that nothing else in the transceiver need be disturbed.) If an R.F. attenuator is not available, calibration marks can still be added. In this case, the nine fiducial marks are just spaced equally across the dial face. Here, we are tolerating the nonlinearity inherent in the dB meter readings for the specific rig being used.

Results

I have used the general method described for several years now, and the benefits, in terms of simplificition and consistency of signal strength reporting have been quite gratifying. It is a real pleasure to give comparative reports on different receivers and not to have the 20 decibel disparity.

Reference:

[1] Robert J. Zavrel, Jr., "A Calibrated S-Meter", Ham Radio, January 1986.

NEVER SAY DIE

Continued from page 4

class from now on and we're going to use a whole page to keep notes. It won't break you. Oops, there go some yellow pads from work.

Up With People

This may be a new concept, but you're making contact with people—real live people. I know you've recognized this on some level of awareness in the past, but the log book approach tends to make us think in terms of working "stations"—where we think of the call letters rather than the person. You tell your wife you worked Germany, not an interesting chap named Lothar Werner in Stuttgart with the call DJ1BZ. You're going to be talking with people from now on, not just places and call letters.

On the page you're going to make notes of anything of possible interest your contact mentions. What's of interest? Ahhh, there's the secret. Who is the most interesting person in the world to you? Yourself—haven't you noticed that's who you talk about all the time? So, if you want to be fascinating to contact, all you have to do is steer the conversation toward getting the other chap to talk about himself. You make notes.

Okay—he'll tell you where he lives. Fine, you don't even have to ask for that. You know, I've mentioned I'm located in Peterborough, New Hampshire, a dozen times in every contact for twenty-five years now and maybe two chaps have ever asked me about Peterborough. Ask me how come I'm living there and you'll get an interesting story. Ask me what's it like around Peterborough and I'll tell you about having one of the largest A&Ps in New England—about the McDowell artist's colony which brings all sorts of famous people to Our Town. I might even mention that Our Town was written about Peterborough—in case you're familiar with the famous play by Thornton Wilder. Peyton Place was written about Gilmanton, New Hampshire. You making notes?

You don't have to bother with notes on the weather—that's just blah blah—like a recitation of my rig model. Of course, if you ask me what I like best about my rig, you might get me going.

The time was when you could ask someone what they did, but now, with almost all hams being retired, it's probably better to ask what they used to do. It doesn't hurt to ask if they have any other hobbies or interests—I've got a few, but I can't remember the last time anyone asked...1968, I think it was.

Oh, you'll run into some hardcore cases—chaps seemingly with no interests whatever. If you ask how many grandkids they have you'll unloose a torrent. I got started late, so I don't have any, but you ask my wife, Sherry, about her grandchildren and you're set for the next half hour. She's got eleven of 'em! Making notes?

By the time you get through asking about the town, what he's done and other interests, the band will probably be changing. File the page by call so you can find it the next time you hear him, and carry on from there. One look at the page and the whole contact will come back to mind just as if it was yesterday—even after a couple of years. You'll find the chaps you contact are turning into people instead of just a line in the old log and a QSL card. It's also handy to keep a cross-index of the chaps you've worked on top of the pile of notes, so you don't have to thumb through to see if you've worked someone.

More Props

Have a road atlas at hand for stateside contacts and the best world atlas you can find for DX. Then, when you talk with Homer Sawtelle W1KPL in Jaffrey Center, you can ask him about Mt. Monadnock, which is near his town. You might find out that the nearest movies are in Keene or Nashua—and that the Monadnock Inn is a pretty good place to eat, if you're in the neighborhood. If you fly, you might drop in at Silver Ranch airport in Jaffrey.

The more you get 'em talking about themselves, the more interesting you're going to be. The more you talk, the more boring the contact—usually. Of course, if you find you both have an interest in guns, collecting comic books, match book covers or antique marbles...you're flying.

I suppose you're so used to being regimented by the League that you're going to want me to print special log pages for you with spaces for the call, name, town... and so on. Give me a break!

Maybe this new aspect of hamming will get you off the kick of moving from one lousy pileup to another, swapping call letters and a report and moving on. Look, you know as well as I that your signal can be heard anywhere in the world on the DX bands, so why all this macho beating your way through pileups? Are you really so insecure that you have to prove to the world that your rig can cream some other poor ham with lower power or worse propagation? And for what? I don't even know where my 300+ countries of QSLs are—probably thrown away sometime. The real fun of amateur radio is the communications it provides, not certificates or a listing in QST. There are thousands of interesting, exciting people out there—all you have to do is pry them out of their shells.

"There are thousands of interesting, exciting people out there."

You know, what seems like an endless number of hams on the bands will start sorting itself out into friends once you make contacts interesting for others. You'll find them looking for you and calling you—and their page coming out of your file and gradually filled as you learn more about them.

If you're into DXing you might ask how things have changed in their country in the last twenty years or so. We've seen change here in America, but it's nothing compared to what's been happening in many other parts of the world. If you're lucky enough to talk with someone from Africa, check out what's happened there! The changes in most of Africa just in my lifetime have been incredible—going from a mysterious dark jungle continent to one where we're reading about the problems of many African countries in the morning papers and watching specials on TV.

When my mother was young she met Osa Johnson while vacationing in Vermont—Osa married Martin Johnson, an explorer, when she was around 15 and went with him to Africa, where they made movies of what they found. The Martin and Osa Johnson movies went over big here. The 1920s and 30s Africa, which had been that way for thousands of years, is now gone—forever: a land of pigmys, women with rings around their necks to stretch them, plates in their ears.

Look for Andy 9M8PV and ask him about the head hunters just one generation ago. Ask about the long-house villages. Ask about the 30-foot croc in the Sarawak River picking off kids swimming in the river and the mystic they brought in from Indonesia to help find it.

Communication Power

Amateur radio gives you the power to actually communicate with Sarawak, not just get a signal report and a QSL. You can talk with hams in Kenya who remember the way it was. Not to disturb your political convictions, but you might even ask some South African hams their perspective on what's going on there—I think you'll be surprised to learn their viewpoint and get an inkling as to how much bias we live with here from our liberal press.

You know, we make fun of the Soviets and their practice of twisting everything to present the distorted view they want their people to believe. Unless we open our ham communications system to other parts of the world we have no way of judging how distorted our own view is.

The same goes for other countries, too. I'm writing this in Leningrad, so I'm keenly aware of how little communication there is between America and the Soviets. It's going to take a lot of persistence to get them over their fear of openness—despite the recent advent of glasnost, which means "openness". Can we ever get them to actually talk about themselves over the air?

For a communications hobby it's amazing how little actual communicating we do.

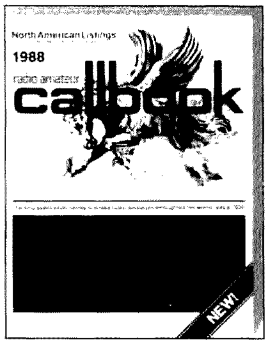
Let's make today the first day of your real ham career. Get a pad, pencil, an atlas and get cracking...see if this doesn't make hamming a lot more fun.

Holiday BUYER'S GUIDE

CALLBOOK

Want to QSL those new contacts? Then you need the Callbook!

The 1987 North American and International Callbooks list calls, names and mailing addresses for over 950,000 licensed amateurs in countries around the world. In addition, they include International Postal Information, Worldwide QSL Bureaus, Standard Time Charts, Prefixes of the World, a Census of Amateur Licenses in each country, and much more. The price for the Callbooks vary. The North American listings are $28, and the International Callbook is $30. These are available in December. The Callbook Supplement, which combines both North American and international new listings, is available for $13. The supplement is published in midyear. The publisher offers both the North American and the International Callbooks are $55. The above prices include shipping to USA addresses only. Amateurs in other countries are invited to request a quotation for LifetimeSubscriptions.

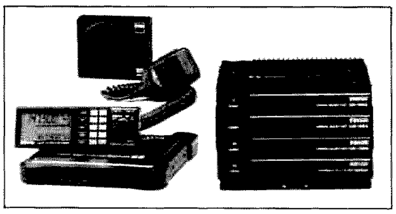


The 1988 Radio Amateur Callbook.

For more information, write to, *Radio Amateur Callbook Inc., 925 Sherwood Drive, Lake Bluff, IL 60044, for your local dealer or circle Reader Service card number 40.*

ICOM

The IC-900 is a six-band VHF/UHF mobile transceiver system featuring fiber-optic control of remote "band units." The compact controller, which measures only 2.9" x 2" x 1", can be placed in any convenient location near the operator, while the band units reside in some other spot in your vehicle (such as the trunk). The band units are connected to the controller by a fiber optic cable to eliminate rf feedback.


ICOM's IC-900A VHF/UHF mobile transceiver.

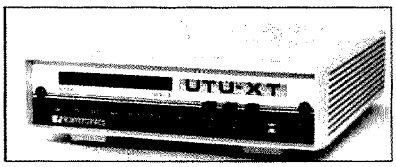
Among the features of the control unit are: 10 memories for each band, memory and programmable band scanning, and crossband operation. Band units are available for 2 meters (25/45W), 10 and 6 meters, 220 and 440 MHz, and 1.2 GHz. The basic control units, microphone, and external speaker retail for $589. The band units are available separately.


The ICOM IC-u2A VHF FM transceiver.

ICOM's new IC-u2AT is a pocket-sized 2m hand-held designed to cover 139-174 MHz on receive and 140-150 MHz on transmit. The Micro features ten memories to store frequency, offset and access tone; an LCD readout on the top panel; scanning; 1 Watt rf output; and 32 built-in subaudible tones. The HT weighs ½ pound and measures 2.3" x 5.6" x 1.1". It's price is $329. For more information contact *ICOM America, Inc., 2380-116th Ave. NE, Bellevue, WA 98004; 206-454-8155.*

KANTRONICS

Accelerate your TNC-1 or TNC-2 into 2400 bps with the **Kantronics 2400 TNC Modem**. This add-on modem mounts directly above your TNC, and adds 2400 bps packet, while retaining 1200 baud packet operation with your original unit. The suggested retail price is $149.

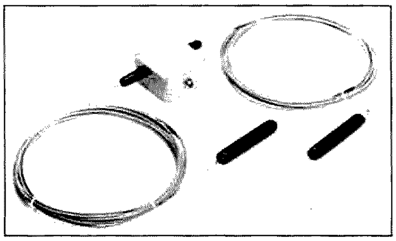


The Kantronics UTU-XT modem.

UTU-XT/P features user programmable parameters, over 100 software commands, and an RS-232/TTL jumper for universal compatibility to any computer with an asynchronous, serial I/O port. UTU-XT/P now operates HF PACKET; along with CW 6-99 WPM; RTTY from 45-300 baud; ASCII from 110-300 baud; and AMTOR, MODES A, B, and L. The user's programmable parameters allow you to specify shift and baud rate, vary Mark and Space tones, and change the center frequency and bandwidth of the CW detector. Since UTU-XT/P is microprocessor based, it has optimum filter settings for each mode, shift, and data rate selected. It also has the added features of push button selectable multiple RTTY shifts, and limiter/limiterless operation for maximum sensitivity. A 12-pole, programmable, switched-capacitance input filter is optimized for each selected shift. The suggested retail price is $290. For more information write or call, *Kantronics, 1202 E. 23rd Street, Lawrence, KS 66046; 913-842-7745.*

POYNTEK

The Snyder Full-Band tm antennas for the 160, 75/80, and 40 meter bands allow maximum use of modern, broad frequency range transceivers and "no tune" power amps to 1000 watts. These wideband antennas for the low HF bands are based on patented technology and eliminate the need for antenna tuners and special radiator networks.

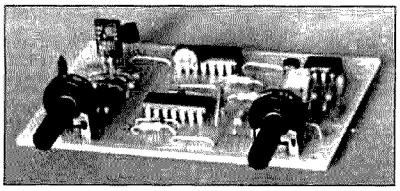

One of Snyder's Full-Band™ wide band antennas.

The three models, FB-160X, FB-75/80X, and FB-40X are constructed of high quality materials including space-age plastics and corrosion resistant, non-ferrous metals to provide low weight, low wind drag, and weather endurance for years. They also include optimized feed modules for near earth installations. Also included are SO-239 connectors to interface with a 50 Ohm coaxial transmission line and a pair of PL-259 terminated antenna radiator elements with end insulators and tie point eyelets.

The Snyder Full-Band tm antennas vary in cost; model FB-160X is $344., The model FB-75/80 is $230., and the model FB-40X is $180. For further information contact *Poyntek Associates, P.O. Box 741, Placentia, CA 92670; 714-993-7525. Or circle Reader Service card number 151.*

BEL-TEK

The BEL-TEK CMOS Keyer Kit uses a triggered clock to completely eliminate the possibility of the first dot or dash being any longer than the character elements that follow. The instant you push the key the character starts, eliminating the delay often encountered in keyers with free running clocks. The digital circuitry of the CMOS keyer provides an exact 3 to 1 weight ratio for perfect CW. The keyer also provides jam-proof spacing, which eliminates the chance of placing dots and dashes too close together. The keyer automatically inserts an element space after a dot or dash is completed, even if a key was pushed before the completion of the space. If both the dot and dash keys are sent simultaneously, the dash will dominate until it is released. All of these features enable you to send effortless perfect code.

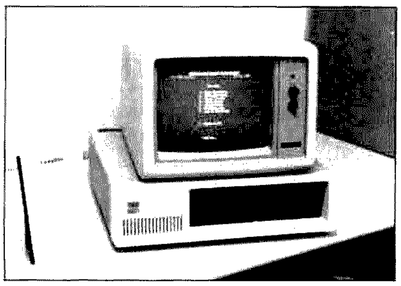


The CMOS keyer from Bel-Tek.

The keyer uses any voltage between 5 and 12 volts DC. The circuit is protected against accidental polarity reversal of the supply voltage. The keyer can operate at any speed between 5 and 50 WPM. The built-in 800 Hz sidetone has an adjustable volume control. The transistor will reliably switch loads up to 250 ma. The keyer is compatible with grid block, cathode keyed, and solid state transmitters. The price for the CMOS Keyer Kit is $9.95 plus $1.50 shipping. For more information write, *Bel-Tek, PO Box 125, Beloit, WI 53511. Or circle Reader Service card number 154.*

ESOFT SOFTWARE

A low-cost electronic circuit design software program has been developed for the IBM-PC. The program called CompDes, is an easy to use menu-driven software tool that has main menu selections starting from Basic Electricity and continuing through Circuit Designs.



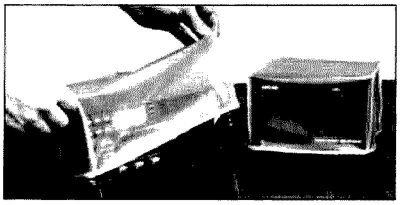
The ESOFT Circuit design program for the IBM—PC and compatibles.

Circuit calculations of resistance, decibels, VSWR ratio resonance, and etc. are possible with this software. It also has menu selections of circuit designs for transceivers amplifiers, transistor schmitt trigger circuits, passive and active filters using operational amplifiers, attenuators, and more. The software was developed by circuits design engineers with over 25 years of design experience, and covers a wide range of engineering topics. In addition to being a design aid, it also makes a great educational tool, and included in the software package is a design manual that compliments the software.

CompDes, comes with a non-copy protected disk and will operate on the IBM-PC/XT/AT/PCjr or any compatible. The cost of the complete package is only $50., and is available from *Esoft Software, 444 Colton Road, Columbus, OH 43207; 614-491-0832. Or for more information circle Reader Service card number 156.*

AMHERST INTERNATIONAL

Cover Craft dust covers are available for more than 50 Ham equipment models as well as hundreds of computer and data processing models. Covers protect against dust, dirt, spills, pet hair and help reduce failures and repair costs. Each cover is DUO-FOLD ™ machine stitched for extra strength and inferior binding or piping is not used. The unique Anti-Static vinyl material has been tested to all government specifications, and is a must for today's solid state circuitry.



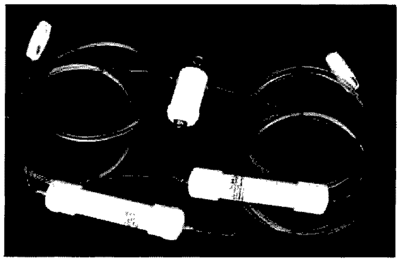
CoverCraft ham radio equipment covers.

The Cover Craft gives your Amateur Station that professional appearance. Our clear taffetta finished material protects but does not hide your equipment's appearance. Most of the models retail for $9. Send for a 20 page catalog to *Cover Craft manufactured by Amherst International Corp., 540 N. Commercial St., Manchester, NH 03101; 603-644-3555. Or circle Reader Service card number 167.*

SPI-RO MANUFACTURING

Spi-Ro Manufacturing offers a complete line of Multi-band Trap Antennas, both dipole and vertical "sloper"types. Covering all amateur radio bands 160 thru 10 meters. It offers the ultimate in trap design. The traps are lightweight, sealed and weatherproof, and feature no-rust, solid brass terminals that do not require no soldering or jumper wires. The antennas handle full power and allow multiple band operation with a single antenna with automatic band-switching. The antennas use 50 Ohm coaxial feeds and have standard SO-239 receptacles.

They come factory assembled or in easy to assemble kit form. Prices start at only $39 postpaid in U.S. Catalog available showing models. *For more information circle Reader Service card number 250.*



The Spi-Ro multi-band trap antenna.

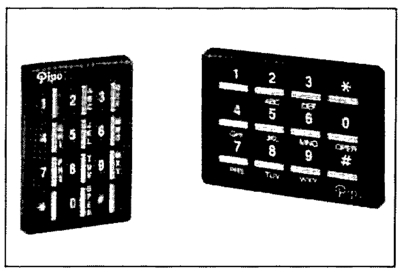
The **"High-Tech Arrestors"** protect transmitters, transceivers, receivers, and other sensitive communications equipment from harmful damage caused by lightning surges, transients, etc. The units utilize a gas filled discharge element, and a secondary stage to provide "double protection" to the equipment. The units restore themselves time and time again for repeated use. The High-Tech Arrestors divert unwanted voltage surges to a safe ground. They are rated up to 2000 watts for transmitter protection.

Prices start at $30. Models are available with UHF, BNC and N type connectors. For more information contact *Spi-Ro Manufacturing, Inc., P.O. Box 1538, Hendersonville, NC 28793. Or circle Reader Service card number 230.*

PIPO COMMUNICATIONS

A high quality DTMF-encoder and keyboard designed exclusively for land mobile applications. Pipo Communications has developed a new keyboard for the land mobile industry, the P-7 Series of 12-key touchtone encoders. They come equipped with steel keys and sealed Gold Dome contacts. The miniature design will fit most radios. The encoders allow output level adjustment.There isn't any RFI, but there is very low distortion - High Audio Output will drive any radio. The wide operating voltage range is 4 - 16 vdc. Current requirements are low: 1 mA in standby and 6 mA keyed at 8 Volts.

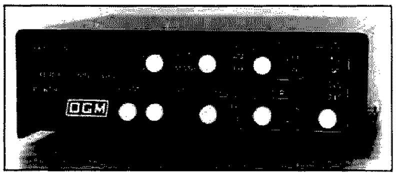
The P-7V and the P-7H both sell for $53. depending upon the amount wanted. For more information write or call *Pipo Communications, P.O. Box 2020, Pollack Pines, CA 95726-2020; 916-644-5444. or circle Reader Service card number 229.*



The P-7V and P-7H 12-key touchtone encoders from Pipo Communications.

DGM ELECTRONICS, INC.

The FAX-1000 connects between your communications receiver and Epson graphics compatible printer. It allows you to print weather charts, satellite pictures and press photos. It will copy AM facsimile signals sent by weather satellites or FM facsimile signals, which are normally sent on HF. The FAX-1000



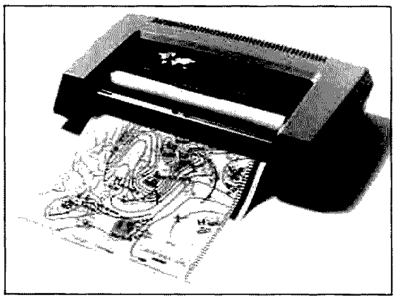
The DGM FAX-1000 FAX converter.

will copy all standard speeds and indices of cooperations. Pictures can be inverted or printed in either direction. A 10 segment bar graph allows you to accurately tune in the station copied. Automatic or manual copy modes are available. In the automatic mode the unit will wait for the appropriate signals from the sending station to start the frame finally stop printing. In the manual mode the operator can start the printing and manually frame the picture with a front panel button. Front panel LED indicators and pushbuttons make the FAX-1000 easy to operate.

The FAX-1000 is housed in a compact, attractive RFI proof aluminum enclosure. The unit is powered by a 110 VAC wall transformer, which is included. The FAX-1000 costs only $299. For more information contact:*DGM Electronics, Inc., 901 Elmwood Ave., Beloit, WI 53511; 608-362-0410. Or circle Reader Service card number 228.*

ALDEN

Alden Electronics, Inc. has introduced a professional quality, low cost facsimile Weather Chart Recorder Kit for radio hams or anyone interested in receiving their own weather charts and weather satellite pictures at home or office. The easy to assemble kit provides a recorder that, when connected to a stable HF general coverage SSB receiver and suitable antenna, can receive weather charts, satellite pictures and oceanographic data from over 50 transmitter sites around the world.



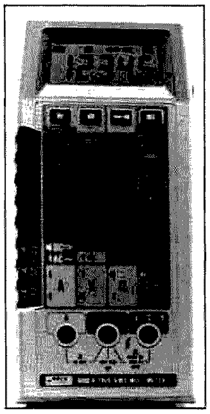
The Weather Chart Recorder Kit from Alden Electronics, Inc..

The kits can be completed in five or six hours. An illustrated, step-by-step assembly manual with separate operator's manual and a worldwide radiofacsimile frequency guide and broadcast schedule are provided. All major components and circuit boards are pre-assembled and tested. Once it is complete, it runs at 120 scans per minute on a standard 115 VAC 60 Hz power and consumes 30 watts when printing and 10 watts in standby mode. Low cost paper cassettes available from Alden provide approximentely 50 charts, 11 inches wide.

The Weather Chart Recorder Kit costs $995 plus $5 shipping and handling in the U.S.A. plus applicable state sales taxes. For additional information contact: *Alden Electronics, Washington Street, Westboro, MA 01581; 617-366-8951. Or circle Reader Service card number 227.*

FLUKE

The Fluke 8060A Digital Multimeter is a handheld, microcomputer-controlled 4 ½ digit test instrument. It has performance and features that make it ideally suited for broadcast engineers and hams alike. In addition to the usual DMM functions of ac/dc voltage and current, and a wide range of resistance measurements, the 8060A offers frequency measurements to 200 kHz and relative and dB measurements with almost any impedance. The 8060A is the only handheld DMM with Hz, dB and relative measurement functions. These features are essential to quick, efficient troubleshooting of communications equipment.

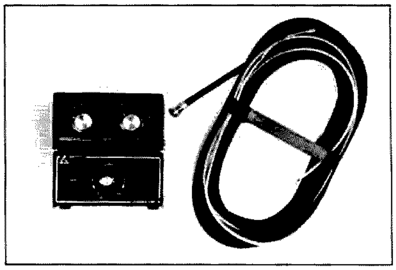


The Fluke 8060A Multimeter.

The Fluke 8060A features 0.04% basic dc accuracy, and has a one year calibration cycle and warranty. It comes equipped with test leads and operator's manual. A full line of accessories allow the 8060A to measure temperature, high current, high voltage, and high frequency signals, plus a number of cases and test lead kits are available for opertor convenience. Suggested U.S. list price for the Fluke 8060A is $349. For the name of the nearest Fluke Distributer, or a free product brochure on the Fluke 8060A call toll-free 1-800-227-3800, ext. 229. For information on Fluke distribution opportunities, call toll-free 1-800-426-0361, or write *John Fluke Mfg. Co., Inc., P.O. Box C9090, Everett, WA 96206. Or circle Reader Service card number 226.*

GROVE

Grove's Hidden Antenna System solves apartment dwellers' dilemma. Grove Enterprises have solved the age-old question, "What's an apartment dweller to do for a



The Grove hidden antenna system.

shortwave or scanner antenna?" Grove is famous for their innovative and inexpensive solutions to communications problems. The Grove Hidden Antenna System combines a flexible antenna with a powerful, 30 dB gain preamplifier for continuous 100 kHz-1000 MHz receiving applications, making it ideal for indoor shortwave, longwave and VHF/UHF scanner listening, even TV and FM reception. The two output connections allow the simultaneous use of two receivers on the same compact antenna system. A separate preselector is also available to eliminate shortwave intermodulation and image interference in particularly troublesome installations.

The Grove Hidden Antenna System costs between $48 and $100 depending upon options. For complete information write,*Grove Enterprises, PO Box 98, Brasstown, NC 28902; 704-837-9200. Or circle Reader Service card number 225.*

UNIVERSAL SHORTWAVE RADIO

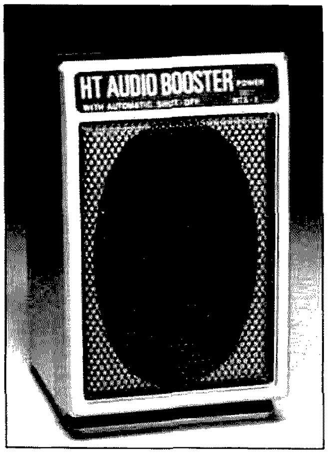
Use your shortwave radio to see the world! Intercept and print fascinating facsimile (FAX) transmissions. See transmitted maps, photos, and charts from weather, press and military stations world wide.

The Indo-Tech M-800 facsimile converter.

The Info-Tech M-800 FAX Converter works with many dot matrix printers and your quality communications receiver and it is only $499 plus shipping. Contact Universal now for full information and you free pamphlet titled "Receiving FAX On Your Shortwave Radio", at *Universal Shortwave Radio, 1280 Aida Drive, Reynoldsburg, OH 43068; 614-866-4267. Or circle Reader Service card number 224.*

NAVAL

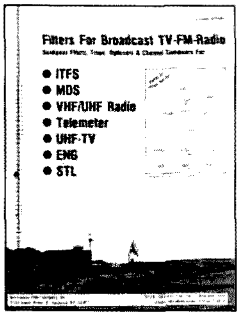
A battery operated, Amplified Speaker with a unique feature! If it senses no audio input for more than 60 seconds, it burps once and goes to sleep! While in the sleep mode the HTS-1 does not draw any current. No dead batteries because you forgot to shut it off! As soon as input returns, (like a breaking squelch) it comes awake and gives you a big speaker sound. It is yours for only $25. For more information contact *Naval Electronics Inc., 5417 Jetview Circle, Tampa, FL 33634; 813-885-6091. Or Circle Reader Service card number 223.*



The HT Audio Booster amplified speaker from Naval Electronics.

MICROWAVE FILTER COMPANY

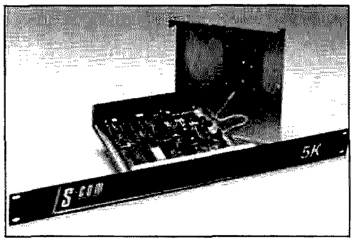
Microwave Filter's new edition of Filters for Broadcast TV-FM-Radio, BTV/87, describes bandpass filters, traps, diplexers and channel combiners for broadcast television and radio. One section describes ITFS bandpass filters for single channel or channel groups, and combiners for channel or two channel groups. Also included are filters for MDS. For ITFS/MDS systems, another section describes a video and aural combiner, a coupler which allows MDS to be added to an existing ITFS system and a bandpass filter that passes the entire ITFS and MDS band.



The New Broadcast Filter catalog.

Among other offerings in the catalog are multiband filters that allow other broadcast bands to be added to one tower, combiners and bandpass filters for UHF, ENG bandpass filters, interference traps, viewer and listener interference traps, distribution filters and TVRO interference filters. Filters with custom specifications may also be ordered. For a free copy of this catalog contact *Linda DeCoursey at Microwave Filter Company, Inc., 6743 Kinne St., East Syracuse, NY 13057.* Call toll free 1-800-448-1666 or collect 315-437-3953 New York, Hawaii, Alaska and Canadian residents. *Or circle Reader Service card number 222.*

S-COM



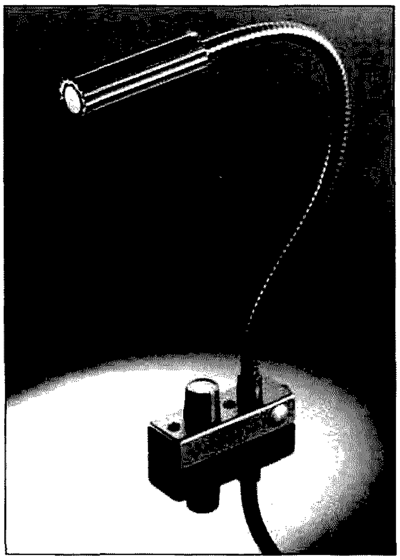
The S-COM 5K.

The S-COM 5K Repeater Controller is fully programmable via DTMF commands. Unlike other controllers, the 5K does away with the delays and reprogramming charges involved with custom ROMs; there are no jumpers or diodes to change. Data is retained in non-volatile memory, ensuring that no information is lost during power outages. The CMOS design draws little power, so it's perfect for emergency, portable, and solar-powered repeaters. Use 5Ks for main site control and control of remote receiver links.

For professional sounding audio with full squelch tail and DTMF elimination, add the 5K-ADM Audio Delay Module. It connects to the 5K through a single ribbon cable, and can be installed in the field. The optional 5K cabinet provides mounting for both the controller and the Audio Delay Module. Never before has such powerful control capability been available for $189. For more information write or call *S-COM, P.O. Box 8921, FT. Collins, CO 80525-0700; 303-493-8316. Or circle Reader Service card number 221.*

LITTLITE

Littlite Lamps, the flexible gooseneck lamps with versatility and style, are ideally suited to

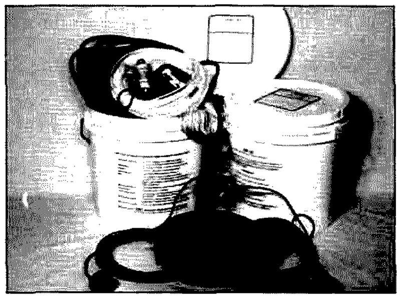

One of the Littlite Lamps from Littlite/CAE, Inc..

any task involving accurate, close or detail work. Utilizing halogen technology, the High Intensity Series efficiently produces crisp, bright white light. The light is concentrated in a tightly controlled pattern easily aimed exactly where you need it. The Low Intensity lamp produces enough light for many tasks in dimly lit areas. With its low power incandescent light source this Littlite is best suited to applications where a high level of light is unacceptable.

"L" series sets come complete and ready for easy surface mounting. All sets are available in 6, 12, or 18 inch lengths with bulb, mounting base and fully adjustable dimmer. Each set also includes a 6 foot cord, a two piece snap mount, screws for permanent mounting, and a wall plug-in transformer for 120 volt operation. The Littlite prices range from $31 to $60. For more information write or call *Littlite/CAE, Inc., P.O. Box 430, 10087 Industrial Drive, Hamburg, MI 48139; 313-231-9373. Or circle Reader Service card number 220.*

ANTENNAS WEST

The QRV 160-10, is a low visibility, all band HF antenna originally created for


The QRV 160-10 Antenna package.

rapid emergency installation. Speed and ease of erection result from the use of special kinkproof wire. The result is a durable antenna easily installed by a single person. The QRV 160-10 is insulated and completely weather sealed, a feature that prevents corrosion from acid rain and air pollutants, thus ensuring quiet reception over the years. It may be connected directly to transceiver or transmatch with its PL 259 connector. The feedline may be extended as necessary with 50 Ohm coaxial line.

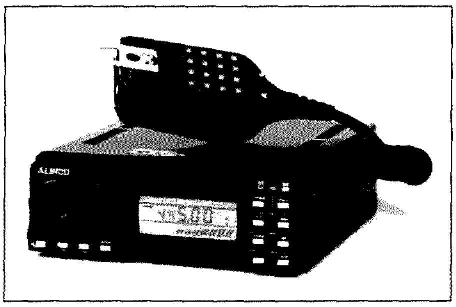
Based on the popular G5RV design, the QRV 160-10 measures 102 feet end to end, and can be installed in dipole, V, sloper or folded configurations. Unique adjustable insulators facilitate bending to fit available space. An extensive technical manual explains how to obtain desired results from difficult installation sites including spans as short as 26 feet. The QRV 160-10 is rated for full legal power. It comes ready to use and is priced at $50 including U.S. delivery. *Circle Reader Service card number 219 for more information.*

The QRV-QL Quick Launch System for Wire Antennas is a rapid system for hanging wire antennas from available supports up to 75 feet high without requiring exceptional strength or exertion. The system eliminates climbing, complicated paraphenalia, and the need to learn difficult skills.

The QRV-QL kit consists of a high visibility fluorescent projectile, twilight view kink proof launch line, safety protector, and a line carrier that also serves as a storage container for the kit. It comes with a manual detailing the method of most effective employment and reviewing safety considerations. The QRV Quick Launch kit comes ready to use and is priced at $13 including U.S. delivery. *Circle Reader Service card number 218 for more information.*

The QRV 160-10 Emergency Pack includes the QRV 160-10 antenna, the QRV-QL Quick Launch system, and everything else needed to install an effective all band antenna system. The Emergency Pack also includes a special Marconi adaptor and all band counterpoise, which quickly transform the antenna into an efficient top loaded vertical for low angle radiation on the 160, 80, 40, or 30 meter bands. Also included are a 70 foot coaxial feed- line extension with hand soldered, weather sealed connections and 200 feet of rot proof Dacron ™ support line. The entire package is contained in a weatherproof carrier bearing instructions and checklists on the outside.

The Emergency Pack is priced at $120 including U.S. delivery. *Antennas West, 1971 N. Oak Lane 1300 E., Provo, UT 84604-2138; 801-375-0247. Or circle Reader Service card number 217.*



The ALD-24T Dual band mobile transceiver frtom Alinco Electronics Inc..

ALINCO

The ALD-24T Dual Band Mobile Transceiver is designed to be the ultimate in compact size with an impressive array of features, allowing maximum flexibility in automobile installations. Advanced engineering and technology make it possible to offer a complete dual band radio in a very compact package. The standard features include 21 memory channels, 2 VFOs, 25 W output, and Encode/Decode CTCSS. Repeater offsets are fully programmable, and the unit allows full duplex, cross band operation. Frequency coverage is 140-149.995 and 440-450 MHz. The ALD-24T dual bander is which is priced at $580.

For more information contact *Alinco Electronics Inc., 20705 S. Western Ave., Suite 104, Torrance, CA 90501; 213- 618-8616. Or circle Reader Service card number 216.*

The Datong multi-mode Audio filter FL-3.

GILFER SHORTWAVE

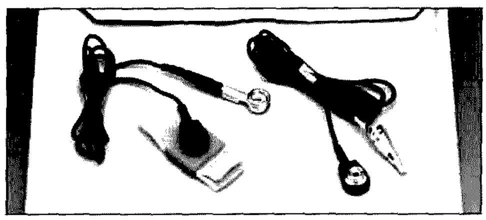
In one stylish case the Datong FL3 Automatic Audio Filter offers the complete solution to receiver audio processing. This filter automatically eliminates unwanted interference from tune-up tones or heterodynes 200-4000 Hz with a scanning, switched capacitor filter that phase locks to the undesireable signal. The user can manually tune a second notch filter 200-3500 Hz. The FL3 also features adjustable low and high pass filters with very sharp skirts. For CW and RTTY tuning, the individual filters' characteristics can be combined to yield a 10- or 12-pole filter, depending on the user's need. The FL3 is easily connected in series with any speaker or headphones and does not require internal modification to the receiver. The unit requires 10-15 Volts DC, 400 mA maximum.

For more information contact *Gilfer Shortwave, 52 Park Ave., Park Ridge, NJ 07656. Or circle Reader Service card number 215.*

JENSEN TOOLS

A Static Control Companion Kit has been designed by Jensen Tools to fit behind the upper pallet of a tool case or inside a briefcase. Essential for the protection of static sensitive devices in the field, the kit opens up to a full 18 x 24" static dissipative work surface with a 5 ft. grounding cord for the mat and adjustable elastic wrist strap with 4 ft. ground cord for the wearer. The kit includes hardware and instructions for correct hook-up to insure the safety of both the static sensitive components and the user. Meets or exceeds all applicable military and EOS/ESD standards. Only for $30.

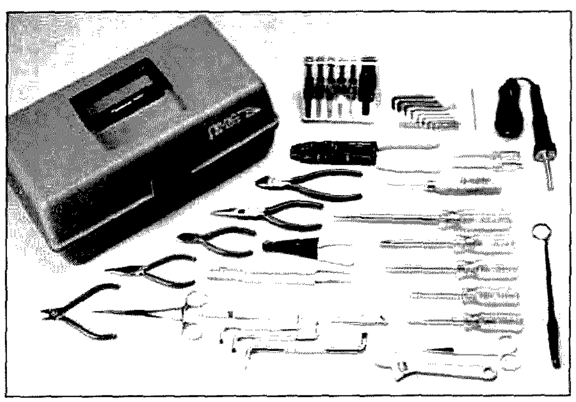
For more information and free catalog of other products for electronic engineers and technicians. *For more information circle Reader Service card number 214.*



Static Control Kit for field service personel, from Jensen Tools, Inc..

Jensen Tools has a new tool kit for the advanced student of electronics and skilled hobbyist. Recommended also for small service shops and skilled home repair, the Deluxe Tech School Kit (#23B002) includes screwdrivers, nutdrivers, wire stripper/cutter, pliers, scissors, wrenches, hemostat, mirror, holding tweezer, soldering equipment and more. A total of 28 quality tools are furnished in a 13⅞ x 6⅞ x 7 inch durable plastic tool box with lift-out tray, positive latch and carrying handle. The kit is priced at $79.

For more information and free catalog, write or call *Jensen Tools Inc., 7815 S. 46th St., Phoenix, AZ 85044; 602-968-6241. Or circle Reader Service card number 212.*

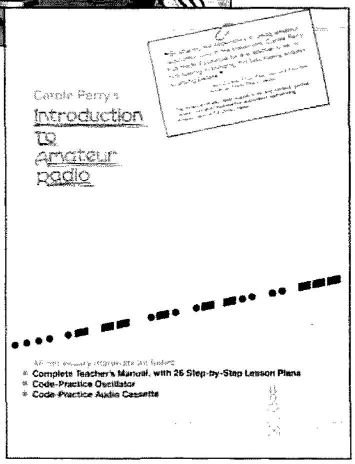


The TELVAC Deluxe Tech School Kit from Jensen Tools, Inc.

MEDIA MENTORS INC.

At last a Ham Radio curriculm written specifically for the classroom teacher! "**Introduction To Amateur Radio**" contains a teacher's manual with 26 step by step lesson plans designed to motivate and instruct chil-

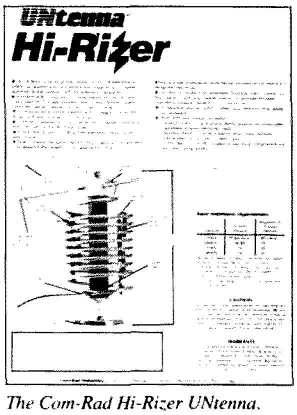
Hands-on learning from Media Mentors, Inc.



dren of all abilities, a custom-made code practice oscillator, and a high motivational code practice audiocassette to follow the lesson plans. The material is based on 6 years of teaching the course at Intermediate School 72 to thousands of youngsters. The program encompasses all areas of a school's curricula, and can be taught as a course unto itself or as a unit in a science program. A 24 hour hot line is available to any teacher buying the program. The package includes homeworks, quizzes, enrichment activities, and reproducibles. The price for the whole package is $100. For additional oscillators is $20, and an additional cassettes are $7.

For more information contact Carole Perry WB2MGP, (Dayton Ham of the Year 1987). *Media Mentors, Inc., P.O. Box 131646, Staten Island, NY 10313-0006; 718-983-1416. Or circle Reader Service card number 211.*

COM-RAD INDUSTRIES



The Com-Rad Hi-Rizer UNtenna.

A unique concept in a low profile antenna for radio communications is the Untenna Hi-Rizer. The antenna is a full-sized, 40 through 10 meter vertical, wound down to 15 inches in height to let you put it just about anywhere! It is continuously tunable from 7 to 30 MHz for Amateur, Commercial and Government Service. The Untenna Hi-Rizer's model number is CR4010A. It is available for $117. plus $5. shipping and sales tax where applicable. The purchase price includes antenna, feedline and mount of your choice. Additional mounts are $15. each (and $2. shipping when ordering separately). The mounts available are a magnetic or a clamp mount for use on large metal surfaces. It is also available with its own ground screen when the use of a metallic surface is not convenient.

For more information write or call *Com-Rad Industries, 25 Imson St., Buffalo, NY 14210; 716-823-0331 or 716-773-1445. Or circle Reader Service card number 210.*

TEN-TEC

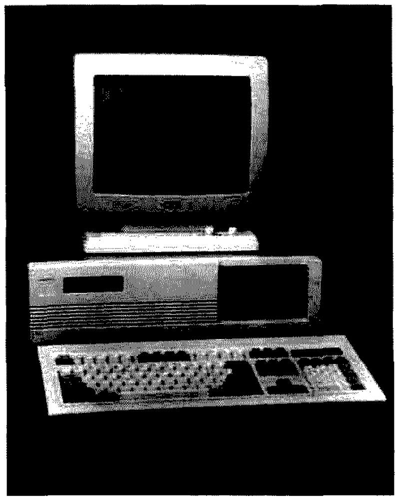
Meet America's newest full featured, synthesized transceiver. The Paragon, Model 585. Its general coverage receiver tunes 100 kHz- 29.9999 MHz, and it transmits at 100 watts output on all authorized frequencies. Included features are 62 full-function memories, dual VFOs, noise blanker, speech processor, RX and TX offsets, QSK with a changeover time of less than 30 ms, five IF filters that are front panel selectable independent of mode, selectable tuning rates, passband tuning, audio bandpass filtering, tone control, squelch, notch filtering and more. The sixty-two programmable memories that include frequency mode, filter selected, channel number and a 7 digit alpha-numeric tag for entering a net name, call sign or I.D. of your choice. The channels scanned are totally controllable with global lock-out, global reset and individual lock-out and reset. The frequency selection can be made using the main tuning knob, keypad direct entry or up/down buttons that can shift on MHz or to the next ham band.

The Paragon Model 585 transceiver.

The Paragon Model 585 is priced at $1995. If you want more information please contact *Ten-Tec, Highway 411 East, Sevierville, TN 37862; 615-453-7172. Or circle Reader Service card number 204.*

COMPETITIVE COMPUTER SOLUTIONS

This company recently introduced an IBM PC/XT compatable computer system designed exclusively for the amateur radio operator. Called the HR8810 Computer, the system boasts a 640K 4.77/10 MHz externally



The HR8810 IBM PC-XT made especially for amateur radio computer.

switchable motherboard, two half-height floppy disk drives, a full compliment of input/output ports, a high quality CTX monochrome monitor, and an AT-style enhanced keyboard. Also included with HR8810 are special RFI reduction interface cables with foil and braid shielding and a copy of MS-DOS 3.21.

The introductory price of the unit is, as the corporate name suggests, competitively priced at $900. For further information write to, *Competitive Computer Solutions, Inc., 5721 Bayside Road, Suite A, Virginia Beach, VA 23455; 804-460-9828. Or circle Reader Service card number 264.*

Clear Channel's Ranger AR-3300

Affordable 10-meter Fun

Clear Channel Corp.
PO Box 445
Issaquah WA 98027
FAX: 206/392-8413
Price Class: $395

by Marc Stern N1BLH

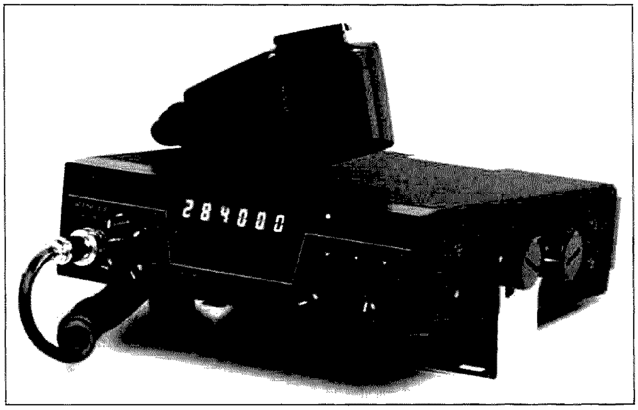


Photo A. The Ranger AR-3500. The 3300 and 3500 models are identical rigs except for their final stages, which output 25 and 100 Watts, respectively.

With all the hoopla over Novice privileges on 10 meters, you wonder why more manufacturers don't respond with multimode single-band rigs to give Novices exposure to HF operation?

Most of the industry might be missing a beat, but not Clear Channel of Issaquah, Washington. It offers two versions of its 10-meter monobander: the Ranger AR-3300 (25 Watts output), and the Ranger AR-3500 (100 Watts output). After using the AR-3300, I can say that Clear Channel has a product that the rest of the industry will have to contend with.

A Full-Featured Rig

A look at the specifications will confirm it is quite a capable transceiver. First of all, it features wide bandwidth that covers the whole 10-meter band, and it is totally microprocessor-controlled. It also sports multimode capability—AM, FM, CW, and both upper and lower sideband—so you can also use radioteletype.

Before continuing, a word about CB-to-10 conversion. Of course, you can convert a CB rig to 10 meters with the change of a crystal and retuning. But you limit your output to under10 Watts, and the CB rig's bandwidth limits frequency coverage. Most CB conversions allow only one mode of operation. So, while the CB conversion might seem economical, it really can't compete with a rig like the AR-3300.

The low-power version features 25 Watts output on CW and SSB peaks and 8 Watts output on FM. The high-power version features 100 Watts. When 10 meters is open, the low-power version is adequate. During the peak sunspot years of the last cycle, I had a lot of fun with mobile 10-meter sideband from a converted CB rig with 12-Watts peak-to-peak. Since we're several years from the sunspot peak, however, don't discount the 100-Watt rig.

The transmit section of the Ranger AR-3300 boasts carrier suppression that is better than 40-dB-below-peak output. Unwanted sideband suppression is better than 50-dB-below-peak output (using a 1-kHz tone) and spurious radiation is better than 50-dB-below-peak output.

Because it is synthesized and microprocessor-controlled, the AR-3300 is very stable. Frequency stability is better than 10 ppm after a 15-minute warmup. Maximum FM deviation is set at 1.5 kHz and the AR-3300 uses a low-impedance (500–600-Ohm) microphone.

On the receive side of the Ranger AR-3300 transceiver, image rejection is better than 70 dB and i-f rejection is better than 80 dB for all frequencies. CW and SSB selectivity is 4.2 kHz at −6 dB, and 8.6 kHz at −60 dB. For FM and AM, the selectivity figures are 6 kHz at −6 dB, and 18 kHz at −60 dB.

> *"It is quite a capable transceiver."*

Sensitivity is better than 0.3 uV at 10 dB S/N for SSB and CW and better than 0.5 uV for 12-dB SINAD. The AR-3300 is both very sensitive and selective.

This rig is a dual-conversion superheterodyne receiver. The first i-f is 10.695 MHz and the second is the standard 455 kHz. Dynamic range is better than 100 dB.

For portable operation, the AR-3300 is ideal. Although it's no small-fry at 7 x 9 x 2.5 inches and about 4 pounds, it is still a lot less to carry than the standard 100-Watt mobile rig. Also, with the low power AR-3300, you'll find you can use a small power supply to run it at your home station. A gel cell or an auto battery can serve as a convenient power supply for portable operations. The low-power version draws up to about 4 Amps on voice peaks or about 2.5 Amps on FM. The high-power version should draw about 20 Amps on peaks.

Speaking of voice peaks and audio, the AR-3300 delivers more than enough good audio at 2 Watts output. You should find that you'll hear CW or sideband even in a relatively noisy environment.

Operation Controls

The rig does not have a frequency selection knob in the center. Instead, Clear Channel has opted for a series of 6 rocker switches. Each one controls a segment of the 6-segment display. The buttons also control scan rate and direction. The frequency display gives you resolution to the nearest 100 Hz.

Just below the frequency control switches a series of momentary contact mode buttons determine how the rig will scan (programmed or memory). Just to the right of the frequency control switches three pushbuttons control offsets for repeater work. The rest of the front panel consists of controls for microphone and rf gain; the receiver incremental tuning (RIT) control; all-mode squelch; function selector (AM, FM, CW, USB, LSB); and the AF gain control. LED bar meters indicate received signal strength and transmitted power output. Other LEDs indicate operating mode (transmit, receive, standby, split).

The selected memory channel is also highlighted with an LED.

The rear panel consists of a large heatsink; antenna connector (standard SO-239); and jacks for an external speaker and CW key (a miniature plug). There's also the 13.8-Vdc input connector.

Recommendations

I found the AR-3300 to be a very good rig, but there are a few minor annoyances.

The speaker has been placed on the bottom which means that if you use this on a car seat or attach it to the floor, then most of the audio is directed downward and is muffled. If you're going to mount it, I would suggest putting it under the dash to get the full effect of the speaker. And, if you're using it at home, I suggest using the mounting bracket as a tilt bail so the audio bounces off a table surface.

Also, the RIT control is limited to about 500 Hz above and below the center frequency. It does an adequate job for signals that are quite near the frequency in the yellow-green display, but you'll find that you have to punch the frequency change buttons to zero in on the signal. I suggest more RIT range as a future improvement.

Another point is the all-mode squelch and scanning. The rig will scan a programmed range until it encounters a signal that breaks the squelch. Several times, though, when I compared AR-3300 with others I have, I found that the AR-3300 wouldn't stop on signals I thought it should have. When I loosened the squelch, the signals heard on the other rigs were present. Apparently, the AR-3300 requires a relatively strong signal to open the squelch.

"I wanted a frequency selection dial."

Although I suspect many operators won't be troubled by this, I wanted a frequency selection dial. When I wanted to search through a range of frequencies (without setting the scan), I found it very awkward to have to keep pushing the frequency selection buttons to move up or down in the band. Setting the scan feature wasn't convenient when all I wanted was to casually roam up and down the band. Clear Channel should think of adding a small frequency selection knob to the front of the rig, rather than relying totally on the scan mode. There is more than enough room inside and out to make the addition.

Excellent Choice

Despite these drawbacks, however, the AR-3300 performed very well. For example, the programmable split capability made repeater operation easy. Further, the five memories made it easy to check five of my favorite frequencies when I used the AR-3300. The scan rate was more than adequate, too.

Memory retention, by the way, must be set by turning the squelch control to reset which enables storage voltage so the AR-3300 retains memory.

The AR-3300 remains an excellent choice for full-featured 10-meter operation. It's a rig that occupies an enviable market niche and, in fact, it should spur the market itself.

Marc Stern N1BLH frequently contributes to our pages. His professional interests include documentation for electronic systems.

Continued from page 13
the wrong part of the cycle could cause the switching transient to double the voltage and blow capacitors. My coil uses capacitors with a voltage rating which is twice that of the primary circuit, so I do not use a variac on my system. Set the gaps on the spark gap plates to about ⅛ inch on each gap, then, using alligator clips on the power leads, to the Tesla primary. Tap onto the primary at about 2 turns in from the end of the winding. When you are sure everything is connected correctly, plug in the power and bring up the variac slowly. At this point a loud crackling noise will become evident as the primary circuit spark gap breaks down, the spark from this gap should be blue and bright.

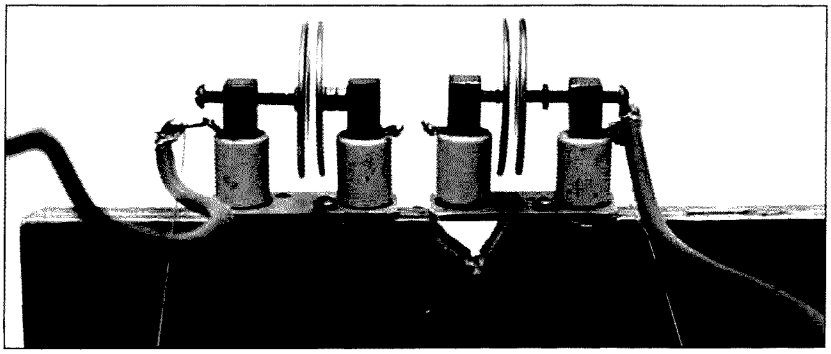


Photo C. Tesla primary spark gap setup as described in text.

With the lights turned down, a corona at the top of the secondary should be plain to see. Further adjustment to ⅛ turn on the Tesla primary should bring improved results. You will also find that fine adjustment of the spark gap also leads to improved results, since the gap has some effect on the frequency of operation. In some cases the bottom end of the secondary must be wrapped in polyethylene to prevent discharge between the primary and secondary. I had no problems bringing my Tesla coil to resonance with the hit and miss method. However, for those with a signal generator and oscilloscope, one can tune up the system more scientifically.

For those readers with such equipment, you can tune up the coil as follows: First, isolate the secondary and place a few loose turns of wire around the bottom of the secondary and connect this wire to a signal generator covering 150-450 KHz. Next, connect the top electrode to the vertical input of an oscilloscope through a 1 megohm resistor. Take the bottom connection of the secondary and hook it to the ground terminal of the scope. Adjust the frequency of the signal generator until the rising signal amplitude of the coil's self-resonant frequency is observed. If you built the secondary according to the plans in this article, you should find the self-resonant frequency to be around 380 KHz. The primary coil must resonant with the secondary, so it must be tuned also.

To tune the primary, the spark gap must be shorted to effectively put the capacitors in parallel with the primary. Connect the oscilloscope across the primary and inductively couple the signal generator to the primary. The signal generator is generating the same signal used to detect resonance in the secondary. Adjust the alligator clips on each side of the primary's center tap until resonance is observed on the scope. The secondary's form should not be anywhere near the primary for this operation.

Start the Show

My Tesla coil is put into operation whenever guests or nephews arrive at my home. It has also been demonstrated at our local college for the electronics and physics departments. The reaction is always the same. The sight of lightning bolts close up, made on demand, is really something to be seen.

Jon Enoch is an electronic technologist for a Canadian research and development company.

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73 Magazine Product Report Card

Please rate any ham gear you're using from (0) poor to (9) superb.

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Cubic Inch Keyer

Enjoy comfortable iambic keying on the HW-8

The recent purchase of an HW-8 QRP transceiver rekindled my interest in CW. The code may not be as exciting as packet or some of the other new facets of amateur radio, but many enjoy it. It is good at producing usable contacts at very low power levels. But as I went about gathering the accessories for my first QRP foray into the woods, I ran into a snag. What to use for a CW key? My J-38 style key on its heavy brass base was on loan to a couple of fledgling novice friends.

I tried another key and a few homemade substitutes and made a discovery—without a solid base on the key and a table to rest both the key and my arm on, I don't send very good code! I hope to take the rig places where there aren't tables, and since they are darned difficult to backpack, I had a problem. Besides, I've been spoiled by the keyer in the "Big Rig" and the sweet Bencher paddle I have attached to it. Some experimenting with the Big Rig proved that I can send much better code using a keyer and paddle than a straight key in positions likely to be encountered while camping. My goal was clear—I needed to build a keyer suitable for taking camping with the rig. But was it practical?

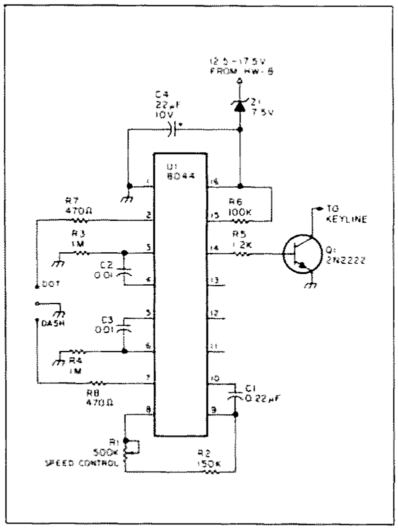

Fig. 1 Schematic for the Cubic-inch Keyer.

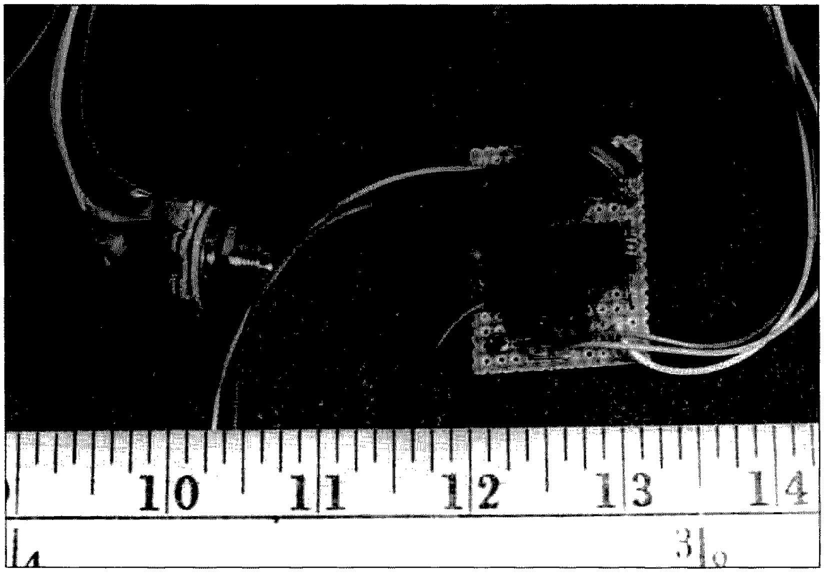

Photo A. Top view of the keyer.

It would have to be small enough to fit into the rig; I didn't want any more boxes and cables to worry about. It needed to be simple enough to complete quickly since I have enough grandiose—and unfinished—projects around. And it would have to draw low current to minimize the load on the station battery power supply. After searching through literature dealing with keyer designs, I settled on the keyer ICs produced by Curtis Electro Devices. These 16- and 18-pin DIP packages handle nearly all of the keyer functions on the single chip. They are CMOS and draw almost no current. They feature self-completing dots, dashes, and spaces; built-in sidetone generator, weight control, key debouncing, and good rf immunity. Both single-lever and iambic (squeeze) paddles can be used with them. They sounded perfect.

Putting on the Squeeze

A quick call to Curtis got the differences between the various versions of the keyer chips sorted out. They produce 4 basic keyer ICs. The 8044M is an 18-pin DIP basic keyer with provisions to drive a speed meter directly. The 8044B keyer chip operates with a special squeeze key mode. An extra element opposite the last one sent is sent when the squeeze lever is released. The 8044BM has both of these features, and the 8044 has neither. Since I have never used the special squeeze technique and had neither the need or the space for a speed meter, I chose the 8044. I placed the order during the same phone call and three days later the chip arrived. After a few minutes of peering at the documentation and sample keyer schematic supplied, I dragged out the CSC Protoboard and sat down in front of the junkbox to do some breadboarding. The circuit shown evolved.

Looking at the left side of the keyer schematic, pins 2 and 7 are the connections to the keyer paddle. The R and C networks associated with pins 3 and 6 provide the timing for the debounce circuitry. The element timing network has its resistor across pins 8 and 9 and the associated capacitor across pins 9 and 10. The capacitor should be a stable type such as mylar™ dielectric. Curtis does not recommend the use of disk ceramics here. The application note suggested that C1 be a 0.15uf, and R1 and R2 be 500k and 100k, respectively. I couldn't find a 0.15uf mylar

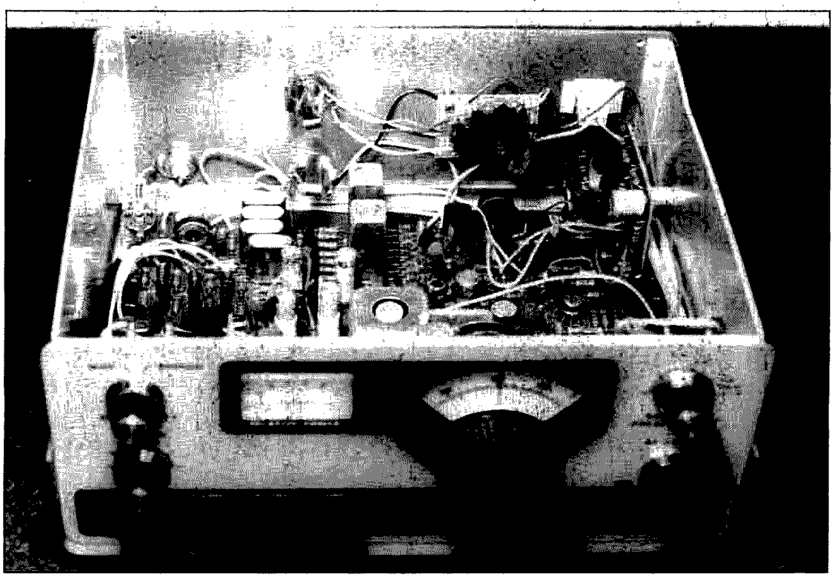

Photo B. The Keyer and jack installed on the inside rear panel of the HW-8.

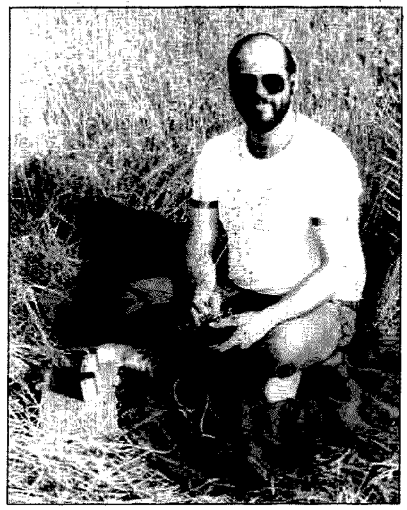

Photo C. WB2EMS and the Cubic-inch Keyer in the field.

capacitor, so I used Kevin's first law of homebrewing: "If you don't have the right size, use what you have and adjust the part connected to it accordingly!"

I used a 0.22uf mylar capacitor at C1. A 150k resistor at R2 worked well with it on the breadboard to give me a comfortable speed range. High-speed CW operators might want to reduce R2 back to 100k, or lower C1 to the recommended value (.15uf) to shift the speed range more toward the top end. I mounted the speed control pot R1 on the circuit board instead of on the outside of the rig. I find that I operate at pretty much the same speed most of the time, and if I need to slow down I just increase the spacing between the characters producing a Farnsworth-type spacing. It would be a simple matter to run leads to a pot mounted on the rear of the HW-8's chassis for external adjustment.

Continuing up the right side of the chip, pins 11-13 are associated with the timing and drive for the sidetone generator in the chip. Since the HW-8 has its own sidetone, these pins are not used and so left open. Pin 14 is the output from the keyer. It swings positive when the keyer is making an element and rests at ground during the spaces. The HW-8 needs to have its keyline pulled low to send an element, so Q1 is used to invert the signal and provide sufficient current sink capability. The base drive is limited by R5. This arrangement should work with almost any battery-powered rig that has a positive voltage that must be pulled down to key, with currents up to about 50 mA. Transmitters in which all of the current in the final amplifier runs through the keyline might need a huskier transistor at Q1 and some more base drive.

Pin 15 is the manual key input and also the weight control pin. The rig already has provisions for a straight key, and a 1:1:3 weigh ratio is fine by me, so in the interests of simplicity, this input is unused. You can't totally ignore it, however; it must be pulled up to Vdd through 100k. I forgot and the chip started breaking into spurious oscillations after a few seconds each time it was turned on until I put the resistor in.

Pin 16 is Vdd, the positive supply input and pin 1 is Vss, or ground. A 22uf capacitor bypasses the chip. The zener diode is used to drop the 12-16 volt supply at the radio to within the 5-10 volt operating range of the 8044. I looked at several different ways of developing a fixed, stable voltage source. Unfortunately they all used more current by themselves than the entire keyer draws! Even though the supply voltage to the keyer will vary as the battery input to the HW-8 sags, I have not noticed any real problem yet. I tested the keyer/radio combination over a 9-16 volt range. A slight slowdown at the lower voltage was just noticeable, but the HW-8 was sounding rather sickly at that point anyway. The circuit only draws 50 microamperes most of the time, and just about 3 milliamperes when the elements are being sent and the base of Q1 is being driven. A nine-volt battery would power it for a long time. If I had only a battery clamp for a transistor battery instead of the zener on hand, the keyer might well have featured a "self-contained" power supply!

The Final Version

After breadboarding the circuit and adjusting component values, it was time to build the final version. I used point-to-point wiring on a small piece of perforated vectorboard. The IC was socketed as recommended by Curtis, and I had to drill 3 holes in the board to mount the potentiometer. The resistors were mounted vertically to conserve board space. I made no attempt to seriously miniaturize the unit, but the choice of a physically smaller capacitor and potentiometer and 1/8-Watt resistors would probably allow the unit to be shrunk to half its current size. As it stands now, the keyer measures about 1.50 x 1.00 x .750 inches, or just a bit more than a cubic inch, hence the name.

I installed the keyer in the HW-8 along the rear of the cabinet by using a single post and some 4-40 hardware to support it off the rear wall. A 3-terminal jack was installed for the paddle to plug into just above the standard key jack. Power was taken from the power switch on the front panel and the keyline and ground were taken from the original key jack. The unit checked out fine when first powered up. The only quirk it has is that it always sends a single dash as soon as it is turned on. This could be avoided by connecting the keyer power line to the battery side of the power switch instead of the radio side. That way, whenever the battery is connected, the keyer would power up. In that case, if the HW-8 was not turned on at the time, the dash sent would have no effect. I prefer to have the power switch turn off everything, so I live with the dash.

Adding the keyer to the little rig has made operating it a real pleasure. Using a paddle works out just fine when camping, and I found a lightweight second paddle to dedicate to the task. The first field test was on a north country fishing trip. The rig was packed up on the motorcycle and survived the bouncing ride and a flat tire to perform splendidly at a rented cabin for several days until the battery ran down. I have even taken to using it at the home station for casual contacts instead of the "Big Rig," propping it up on the arm of my easy chair along with the Bencher paddle and running a piece of coax over to the station antennas.

My goal was to build a simple keyer with a low current drain of small size and with good performance. With a maximum drain of 3 milliamperes, a size of just over a cubic inch, and performance equal to the keyer in the "Big Rig," I feel the goals were accomplished. There's only one problem. Since they enjoyed playing with it so much on the fishing trip, the HW-8 and built-in keyer are now on loan to my friends, KB2ATZ and her OM KB2AUA. Oh well—they gave me my straight key back! 73!

73 SPECIAL PROJECTS

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Repeater Controller PC Board

How to get back on the air again quickly if your microprocessor-controlled repeater dies.

In this modern day of microprocessor-controlled radios, it's rare to find a repeater that doesn't speak to you in its synthesized voice. Many repeater clubs have paid thousands of dollars for these machines that can speak hundreds of words in male or female voices. They do everything under the sun except fix themselves or detect a dying memory backup battery. Now, here's how to get back on the air quickly with an inexpensive repeater controller board when your repeater is on the fritz.

As useful as these silicon-based brains have become, they still have one major drawback: Once one dies, the repeater remains dead until someone skilled enough can fix it. This can render a busy repeater useless for days or weeks until the controller can be reinstalled and reprogrammed.

Constructing the Board

An inexpensive repeater controller board can now be built in a few hours with off-the-shelf parts and kept for emergencies. It does not have an autopatch or IDer, nor is it run by a microprocessor, but it *will* get you on the air again quickly.

My repeater controller board is a combination of several basic circuits containing the standard hold-over timer (HOT) and time-out timer (TOT). It has the option of keying up a transmitter by VOX. When using VOX, audio from the receiver's audio stage or speaker brings up the transmitter. It is not necessary to open a radio and dig into its squelch circuitry to find a point that operates a carrier-operated relay (COR).

The heart of the circuit is a combination of two 555 timer ICs, one used as the HOT and the other the TOT, and a CMOS 4001 quad NOR gate which performs a variety of functions. I chose the 4001 because it has four separate NOR gates—each gate with two inputs—which can accommodate one or two separate conditions to activate the repeater (such as COR and PL).

Pins 13 and 12 of NOR gate A must both be at a logic low, making pin 11 high to activate the repeater. I'll call pin 13 the COR input and pin 12 the VOX/PL/Burst input. DIP switch 1 is set OFF (or open) if the COR input is used, and DIP switch 2 is set OFF (or open) if the VOX/PL/Burst input is used. If not using one of the inputs, setting its respective DIP switch to ON (or closed) will pull the gate low and enables it, allowing transmitter keying information to activate the other gate input.

The COR gate, if used, can be pulled low by a logic low through CR-1, or by 2 volts or more to the base of Q-1 which inverts it to a low. The VOX/PL/Burst gate can be pulled low through CR-2, or by 2 volts or more through CR-2 to the base of Q-2 which inverts it to a low. Diodes CR-4 and 5 are used for different inputs to Q-2 for several functions. CR-3 and CR-4 are used if a "Tone Burst" is needed to initiate the repeater after the TOT has timed out, either by actual carrier timeout or non-use. CR-5 is used when using VOX (CR-3 and 4 must be removed) and rectifies the audio from the LM-386 (used as the VOX driver) to turn on Q-2.

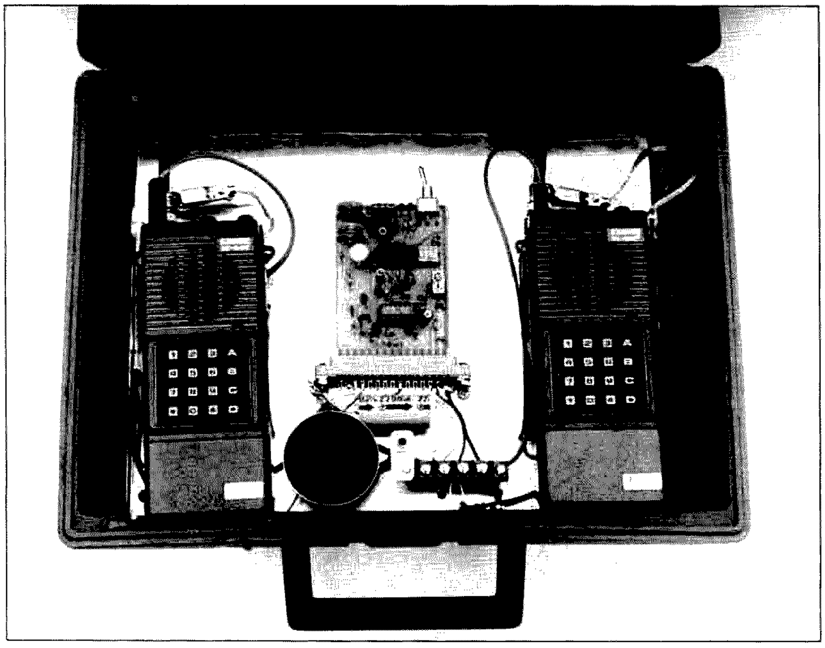


Photo A. Repeater controller PC board with 2 ICOM 4ATs in a portable repeater package, mounted on an aluminum plate.

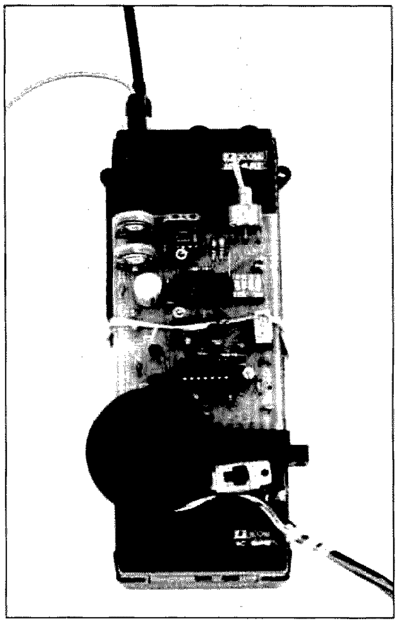


Photo B. Repeater controller PC board attaches to an ICOM HT with a rubber band for fast emergency repeater use.

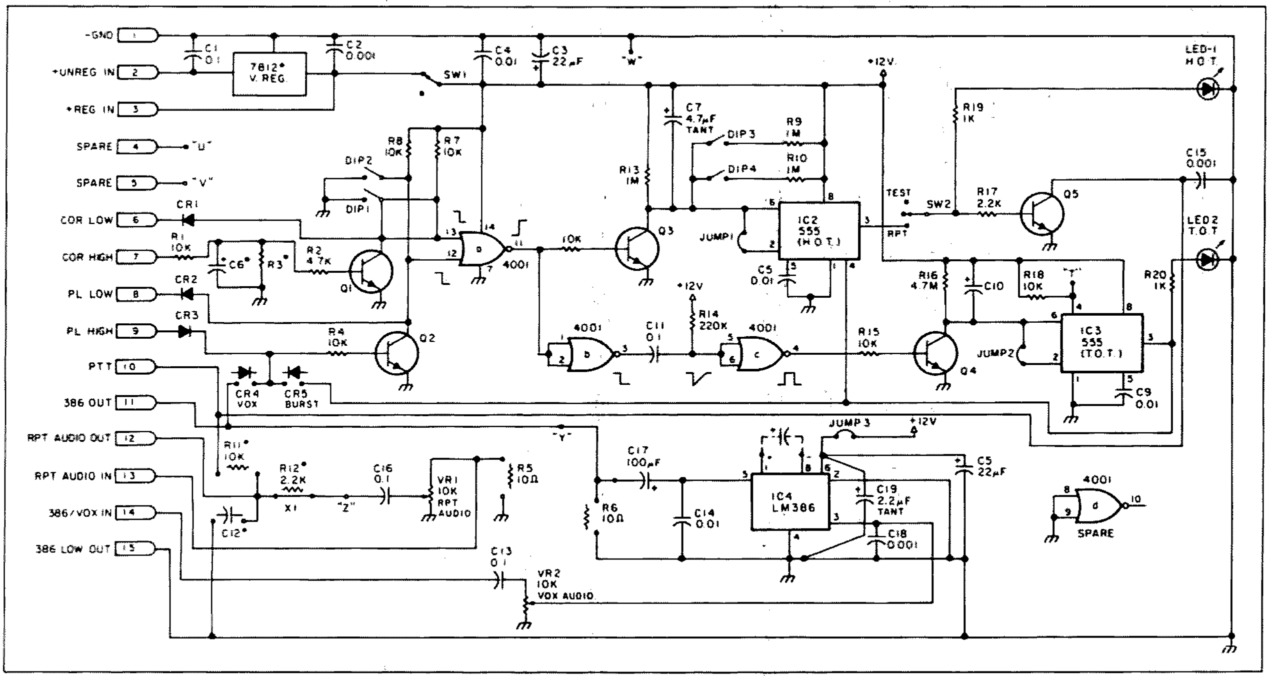


Fig. 1. Schematic for the repeater controller board.

Proper conditions of pins 12 and 13 make the gate's output, pin 11, assume a high logic state. Subsequently, the logic high goes to the base of transistor Q-3, which pulls down the timing capacitor of the HOT 555 timer to a low logic state. The timer's output at pin 3 then turns on as long as the output of NOR "A" gate is high. The time delay, usually about 3 seconds, is set using C-6 and R-13. The timer's output turns on transistor Q-4 and keys the transmitter.

The output of NOR gate "A", pin 11, also affects the input of NOR gate "B". This gate now acts as an inverter and its output at pin 3 goes low to discharges capacitor C-11. As this capacitor discharges NOR "C" input pins 5 and 6 momentarily assume a low logic state. The gate inputs stay low until C-11 is again charged through R-14. During this low state the gate's output, pin 4, goes high for several milliseconds and turns on Q-4.

Transistor Q-4 then discharges the timing capacitor of the TOT, C-10, and causes the TOT 555 output pin 3 to go high. This output is connected to pin 4 (RESET) of the HOT 555, enabling it to key the transmitter. The TOT resets to its maximum time (typically 90 seconds to 3 minutes) every time the output of NOR gate "A" goes high (i.e., every time a carrier is initially detected). If the beginning of a carrier is not detected within the allotted time envelope of the TOT, its output will go low. The HOT's reset pin will assume a low logic state thereby turning off the transmitter. In the event of timeout, a momentary break in the repeater user's transmission will re-enable the repeater.

Note the unusual wiring configuration of both 555 timers. Pins 2 (trigger) and 6 (discharge) are tied together, and pin 7 (threshold) is not used. Also note that both timing capacitors, C-7 in the HOT and C-10 in the TOT, are connected to the working voltage (Vcc) bus and NOT ground. This allows us to use the 555s as "Missing Pulse Detectors" without using additional components shown in manufacturers' information manuals. The same timing formula is still used,

$$T = C \times R \times 1.1$$

where the timing in seconds = capacitance in mF times resistance in megohms times 1.1. Use only high quality tantalum capacitors with values up to 100 uF. The timing resistors should not exceed resistance values over 10 M.

If a TOT is not desired, do not install the TOT 555 on the PC board, or use IC sockets and simply remove it. The HOT will work as long as its pin reset pin, 4, is held high. This pin is internally pulled high, but good design practices say it should be tied high externally to the + supply line.

The LM-386 is a general purpose 400 mW audio amp requiring a minimum of external components. It can be used for a variety of applications: A VOX driver, a line driver, an amplifier to drive a small speaker, and as an audio preamp for some transmitters requiring amplified mikes. Pins 1 and 8 of the LM-386 determine its gain. If the two pins are not used, the voltage gain is about 22. If a capacitor (any value of 2.2 to 10 uF) is connected to these two pins, the voltage gain is about 200. For our purposes we usually will not need the extra capacitor.

The LM-386 will operate anywhere from 5 to 12 volts; be certain not to subject it to more than 15 volts. The output of the LM-386 is pin 11 of the edge connector. If using the LM-386 as a VOX driver, I recommend using a 10 to 12 volt working voltage. This will produce peak voltages high enough to turn on Q-2 after being rectified by diode CR-4. Also, if using VOX, make sure there is a load on the LM-386 output. If a loudspeaker is not needed, the output MUST be terminated with R-6, a 10-Ohm resistor. If the output is not terminated, C-17 will charge high enough to keep Q-2 turned on.

Assembly and Testing

The Repeater Controller can be assembled on small, single-sided PC board with a standard 15-pin, .156 spacing edge connector for easy installation. There are several types of switches available for the power and repeat/off/test switch. If not needed, simply place jumpers in the proper holes. The repeat/off/test switch can be vertically mounted, or, if using the board in a "card cage", can be a 90-degree type to make it accessible from the backplane. I designed the PC board to accommodate switches and eliminate the need for an additional control panel.

There are three jumpers required on the board: Each 555 requires a jumper on the *solder* side of the PC board between pins 2 and 6 (JUMP-1 and JUMP-2). Use insulated wire or sleeving. JUMP-3 is on the component side of the board and connects the LM-386 to the Vcc line.

The voltage regulator is only required for input voltages over 13 volts. Except for using VOX, all circuits will work equally well anywhere from 5 to 12 volts. If using VOX, the working voltage should be from 9 to 13 volts to derive a higher peak output value to be rectified and turn on Q-2.

The 4001 quad NOR gate has an unused spare gate which can be used for custom

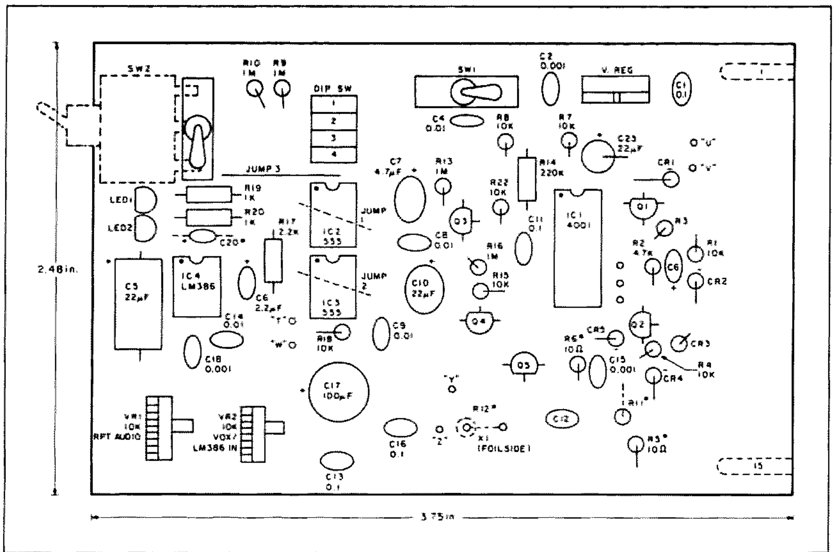


Fig. 2. Parts layout.

applications. I have tied the inputs low, so don't forget to break the traces if you decide to use them.

VR-2 regulates audio to the LM-386 amp. VR-1 is used for adjusting the proper audio level to the transmitter. If the repeat audio sounds "tinny", cut the trace at X-1 on the solder side of the PC board and install a low-pass filter, consisting of R-12 and C-12. I found that using a 2.2k resistor at R-12 and inserting a capacitor substitution box will allow a proper value to be easily found while listening to repeat audio. A fixed value can then be installed at C-12. If R-11 is needed, the value of R-12 can be critical if R-11 is below 6.8k.

If audio is used from a radio's external speaker jack, the internal speaker will probably disconnect. If an external speaker is not used, a 10-Ohm load resistor, R-5, should be used on the PC board. If this resistor is not needed, use a small value decoupling resistor in its place. Adjust the volume control from 1/3 to 1/2 open to assure proper frequency response if the speaker amp feeds repeat audio.

The DIP switch sets the time of the HOT and selects the configuration used to key the transmitter. It can also be used for testing the board. To test the HOT and TOT, set all 4 DIP switches to OFF (or OPEN) and apply power to the board. Neither LED should be on. Set switches 1 and 2 ON (or CLOSED) and both LEDs should turn on. Next, set switch 1 OFF; the HOT LED should stay on for about 5 seconds, and the TOT LED should stay on for the time determined by C-10 and R-16. Then set DIP switch 1 OFF and switch 2 ON. The HOT and TOT LEDs should stay on for the same times as in the previous step.

DIP switches 1 and 2 add parallel 1-M resistors, R-7 and 8, across the timing resistor, R-13, of the HOT. If using a 4.7 uF timing capacitor at C-7 and R-13 is 1 M, one of the DIP switches on will produce a timing of approx. 2.5 seconds, and 1.75 seconds with both switches on.

Any other timing configuration for Ct and Rt will work OK for approximately the same timing periods, such as using a 2.2 uF. capacitor for C-7 and 2.2-M resistors for R-7, 8, and 13. If you use a 1-uF value for C-7, then use 4.7-M resistors for R-7, 8, and 13. Make sure you observe polarity markings for tantalum capacitors!

Some radios, such as the ICOM HTs, have the mike audio and PTT lines combined so that keying the microphone actually connects the mike cartridge and keys the transmitter. If you are using such a radio, connect the edge connector pin 12 (repeat audio out) to the mike/PTT common input, and install R-11 on the PCB. This resistor couples the PTT transistor, Q-5, to the transmit audio line, and pulls the audio line low enough to key the transmitter but not so low as to distort or significantly decrease the audio level to the transmitter. A 10k resistor works well for most ICOM portables, but for some others I had to use different values down to 3.3k.

The PTT transistor, Q-5, goes low (to ground) to key the transmitter. A small value transistor that will handle 100 mA, such as a 2N2222 or a 2N3904, is usually sufficient to key most transmitters. One of my radios is an old GE Master Pro mobile which I made into a repeater. This uses a big PTT relay, so I allowed room on the PCB for a 2N3053 transistor which will handle 750 mA, enough to activate nearly any relay. Make sure a protection diode is connected across any relay used. The value of Q-5's base resistor, R-17, may have to be changed, depending upon what transistor is used, its gain, and how much current is needed.

The current demands of the board vary considerably, depending upon what type of 555 is used, and whether or not the LM-386 is used. Even the voltage regulator itself will pull 5 mA or more in the standby mode. Using the 4001, 2-standard 555 timers, and an LM-386, the current consumption is about 23 mA at 12 volts in the standby mode without using a voltage regulator, and about 20 mA more with each LED on.

If current consumption is of great consequence, use CMOS 555 timers (C555). Using the 4001 and 2-CMOS 555s, the standby current is only 500 nanoamps (0.5 mA) at 12 volts! The LM-386 draws 5 mA at 12 volts. This is a primary consideration if using the repeater controller on its own battery, or if connected directly to an HTs self-contained battery.

Repeater Controller PCB Connections

Connecting the Repeater Controller Board is relatively simple, but several basic understandings of "repeater lingo" is necessary:

- Carrier Operated Relay (COR). The term used when opening a squelch gate activates a relay or performs a function. Most amateur repeaters use this method for enabling the repeater's transmitter. A point in the receiver's squelch circuitry should be found that goes from a lower voltage when squelched to a higher voltage when unsquelched.

Pin 7 of the repeater controller's edge connector is to be connected to the squelch point if an open squelch goes more positive. The minimum open squelch voltage to pin 7 is approximately 2 volts DC (depending upon the transistor used at Q-1), with a maximum of 15 volts with R-1 at 10k and R-2 at 4.7k. The maximum voltage unsquelched should be below the transistor's turn-off point, approximately .5 volts or less. If a point cannot be located where the unsquelched voltage is less than .5 volts, then a voltage divider resistor, R-3, must be used. The value of this resistor must keep the unsquelched voltage less than .5 volts and at the same time maintain about 2 volts or more with the squelch open. If R-7 is used, the voltage must be measured at the point where R-7, R-1, and R-2 are connected. A resistance substitution box can be used to quickly find the correct value.

If a point is located that goes low in the unsquelched state, then connect it to pin 6 of the edge connector. It *must* be noted that this point must go to a true logic low and *not* merely an off state. Also, with the receiver squelched, the voltage at this point may have to be equal to or higher than the operating voltage of the repeater controller logic circuitry to work properly. Diode CR-1 is used to prevent any possible squelch voltage in the radio from appearing on the repeater controller board.

Capacitor C-6 can be used to initiate a slight turn on delay of the transmitter. I found that using a 2.2 to 4.7 uF tantalum capacitor works well, while using a value of R-1 according to the unsquelched voltage. A higher unsquelched voltage will require more resistance. The value of R-2 can also be altered to attain a slight delay in the turn-off of Q-1. Various values of R-1 and R-2 can be used to keep fast noise bursts from inadvertantly keying up the repeater, while at the same time keeping fluttering signal from a stuck micro-

phone from resetting the time out timer. For critical times a diode should be used between the edge connector input and R-1.

If a delay is not desired, use a small value decoupling capacitor such as .001 for C-6. To key the transmitter by COR only, set DIP switch 1 OFF (or OPEN) and DIP switch 2 ON (or CLOSED). It makes no difference whether diodes CR-4 or CR-5 are used, as that section is programmed out via the DIP switch settings. The nominal HOT time is usually 2.5 seconds, and can be set by turning DIP switch 3 ON (or CLOSED) and 4 OFF (or OPEN), or vice-versa. For 5 seconds, turn switches 3 and 4 OFF (or OPEN), and for 1.75 seconds turn switches 3 and 4 both ON (or CLOSED).

•Voice Actuated Transmit (VOX). VOX keys the repeater's transmitter by the presence of voice coming from the receiver. A direct connection to the receiver's squelch circuitry is not necessary, unlike using the COR.

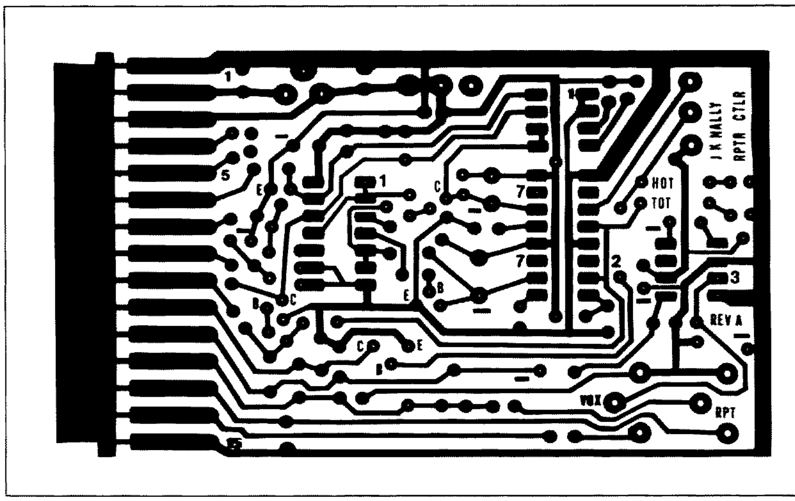


Fig. 3. Positive of circuit board layout.

The VOX circuitry on the Repeater Controller board allows a repeater to be activated by using the unsquelched audio output of the receiver. The main disadvantage of this is that the first syllable is sometimes lost in the transmitter keyup. A longer hold-over timer, typically 5 seconds, is also necessary to prevent the loss of transmitter dropout in long pauses or low volume in the voice of the talker.

These minor disadvantages can be overlooked if a repeater is necessary in temporary or emergency conditions. Nearly any two radios of any frequency or band can be quickly connected together as a repeater with the repeater controller board, as long as one has an external speaker output and the other has an external mike and PTT input.

Connect the receiver's external audio output to pin numbers 13 (repeat audio in) and 14 (VOX audio in) of the repeater controller's edge connector. Turn the receiver's volume control to one-third to one-half open to assure uniform frequency response. Adjust the VOX pot (inside pot) so that the transmitter keys on a medium volume speaking voice and stays keyed on a medium to normal volume speaking level. Some experimentation might be necessary to attain the best adjustment without false keying.

The hold-over timer should be set to the users' talking habits, usually from about 3 to 5 seconds. For VOX applications, set DIP switch 1 to ON (or CLOSED) and DIP switch 2 to OFF (or OPEN). DIP switches 3 and 4 should be OFF (or OPEN) for a HOT time of 5 seconds. For a HOT or 2.5 seconds turn 3 ON (or CLOSED) and 4 OFF (or OPEN), or vice-versa.

•Private Line™ (PL). PL is a Motorola trademark used by hams to denote Continuously Tone Coded Squelch System (CTCSS) or "subaudible" tones. These tones, ranging from 67 to 250 Hz, are neither sub-audible nor assure a "private line". They are most often used by businesses, government agencies, and other users of shared frequencies to eliminate unwanted channel talk from adjacent users. Each business uses a different "tone", has its own subaudible encoder and decoder within each radio, and transmits the "tone" continuously when the transmitter is on.

The CTCSS is used in all UHF business repeaters which allows even a dozen businesses to share a common repeater. Since each business has a different "tone", an individual user hears only units of his business except when monitoring the channel. Monitoring the channel is usually accomplished by ungrounding the button on the back of the microphone or by a switch on the radio front panel or control head.

The Repeater Controller board is designed to use the logic output from a CTCSS decoder and enable the repeater transmitter to be turned on. When using CTCSS in a repeater system, the COR circuitry must also be used to detect a carrier. Together they assure a high degree of immunity from noise and unwanted signals from keying the transmitter.

Pin numbers 8 and 9 on the edge connector are used for the CTCSS logic interfacing. If a detected CTCSS causes the decoder output to go high, connect it to edge connector pin 9. This input will accept from 0 to .5 volts as a logic low and 2 to 15 volts for a logic high. If a detected CTCSS tone causes the decoder output to go low, use pin 8. Remember that in some cases the working voltage of the Repeater Controller board may have to be equal to or less than the undecoded quiescent state of the CTCSS decoder output. Diode CR-2 is used to protect the Repeater Controller board from any possible higher voltages present in the CTCSS decoder circuitry.

When using CTCSS, DIP switches 1 (COR Enable) and 2 (PL/VOX/Burst Enable) must both be OFF (or OPEN). Also, diodes CR-4 and CR-5 must be removed from the Repeater Controller board.

Although only a few amateur UHF repeaters utilize CTCSS, and even fewer on VHF use it, most commercial ham equipment manufacturers are incorporating programmable CTCSS encoders as standard features in their newer radios. With the growing numbers of UHF repeaters appearing on a limited number of frequencies, the expanded use of CTCSS decoders in amateur UHF repeaters will no doubt become more prevalent.

•Tone Burst. This is a simple method for enabling a repeater, either after it has not been used for a certain time, or to "revive" it after it has been turned off. Any type of tone or tones can be used, as long as they can be decoded into a logic condition. Most often used are "audible" single tones ranging from 750 to 2500 Hz., or a DTMF digit or digits.

To incorporate the use of tone burst to enable a repeater with the Repeater Controller board, the COR circuitry must first be used. The logic output from the burst decoder must be connected to either pin 9 (logic high when decoded) or pin 8 (logic low when de-

Continued on page 41

Interconnection Notes

1. If VOX is used to key the transmitter, connect receive audio to both pins 13 (rpt audio in) and 14 (LM-386 input/VOX driver).
2. If the radio's receiver speaker output is used for repeat transmitter audio, then some type of load must be used. If the internal radio speaker is disconnected, then use either an external speaker or a 10-Ohm resistor (R-5) on the PC board.
3. If using VOX, the LM-386 output MUST either be terminated with a 10-Ohm resistor on the PC board (R-4) or an external speaker.
4. The voltage regulator, MC-7812, is necessary only when using the VOX or if the input voltage is more than 14 volts. It can also be omitted if using VOX and a regulated voltage from 10–12 volts is available from an external source. The logic will work anywhere from 5 to 14 volts. The maximum working voltage for the LM-386 is 12 volts.

coded). Use the same logic levels and connection as explained in the paragraph under "PL".

DIP switches 3 (COR ENABLE) and 4 (PL/VOX/Burst Enable) must both be in the OFF (or OPEN) position. Diode CR-5 must be used on the repeater controller board, and remove diode CR-4 (from VOX amp output).

To enable the repeater, a carrier must first be detected by the COR circuitry. A tone burst must then be detected to "start" the repeater. Once the repeater is enabled, it will stay active as long as a carrier is detected within the time envelope of the time out timer (TOT). Every time the beginning of a carrier is detected by the COR, the TOT is reset to its maximum time. Once the TOT times out, a tone burst must be used again to enable the repeater.

Although very few repeaters can be found with tone burst access, its use may reappear again with the advent of closer repeater location spacings. When mobiles of one repeater inadvertantly key up another repeater, the implementation of tone burst can help ease matters. Since most radios now have DTMF encoders, almost no one will be excluded from using the repeater. The tone burst can easily be a single DTMF digit or a "stretched" DTMF digit to enable a repeater. This can be accomplished by simply using two inexpensive NE-567 tone decoder ICs or, for about $12, a single IC DTMF decoder such as the SSI-202 can be used.

Different variations can be used to enable repeaters. For example, to eliminate repeater kerchunking, the standard COR circuit can be used, and the VOX circuitry on the Repeater Controller board added. Use diodes CR-4 and CR-5 on the board, and take the output from the repeater's receiver speaker and connect it to pin 14 of the Repeater Controller's edge connector. Any other receiver output source can also be used if it unsquelches upon the receipt of a carrier. Adjust the VOX level as explained in the paragraphs in the VOX section.

In doing this, the VOX will logically function as a "tone burst", so a detected carrier and part of the person's first syllable is necessary to enable the repeater. As long as the beginning of a carrier is detected within the TOT's time envelope, the repeater will function as a standard COR repeater. After the TOT has timed out, merely keying or kerchunking a mike is not sufficient to make the repeater transmit because some type of audio is also required.

Using the Repeater Controller

Once the Repeater Controller board is tested, its plug-in edge connector and DIP switch programming allow great versatility. It can be used in a 100-Watt commercial repeater with PL, and one minute later be used as an emergency repeater with 2 HTs using VOX.

This particular PCB and its predecessors are being used for links, commercial and government two-way radio repeaters, and voting receiver arrays. We recently used the Repeater Controller board for the CPRA 145.47 repeater with three voting receivers.

DIP Switch Settings

Switch ON = Closed, and Switch OFF = Open.

DIP SW-1

OFF: Enables pin 13 (COR) to NOR gate, so the COR input must be used for transmit. Use edge connector pin 6 if COR goes low, and edge connector pin 7 if COR goes high.

ON: Disables the COR input to the NOR gate and holds it low, allowing pin 12 (PL/Tone Burst/VOX) to initiate transmitter keying.

DIP SW-2

OFF: Enables pin 12 to NOR gate. The PL/Tone Burst allows TX keying when COR is activated. Use edge connector pin 7 if PL/Burst goes high, and pin 8 if PL/Burst goes low. If using Tone Burst, diode CR-5 must be used and CR-4 must be taken out. If using PL, diodes CR-4 and CR-5 must be out. For VOX only, use CR-4, take out CR-5, and do NOT use any connections to edge connector pins 7 and 8, and use LM-386 audio input to edge connector pin 14.

ON: Allows COR only to be used.

Each voting receiver keys its respective UHF link transmitter through a repeater controller PC board. A stuck mike or receiver failure at one remote voting site cannot tie up or inhibit the voter at the repeater site because of the timeout feature.

Incorporating the VOX feature was inspired by Tim Shingara WB3EYB who, as an officer in the Civil Air Patrol (CAP), needed a method to quickly set up an emergency repeater in remote areas. This had to be accomplished with existing equipment without transporting radio racks, power supplies, batteries, and a duplexer. My repeater controller board enabled them to do just that, and passed its final test in July, 1986 at a CAP ranger camp at Hawk Mountain, Pennsylvania, near Allentown.

Since the Hawk Mountain campsite is 60 miles away from the Harrisburg CAP repeater, Tim decided to set up a repeater on that frequency pair, to accommodate the Harrisburg CAP members who have both rockbound and synthesized radios on that frequency. At that distance neither repeater would interfere with each other.

A repeater was set up using 2 ICOM 02AT HTs, and placed in a jeep parked at the top of the mountain. Both radios and the repeater controller board were connected to the jeep's battery. Two separate antennas were used—the vehicle's antenna on top of the roof was connected to the radio used as a receiver. A portable ground plane antenna was set up about 20 feet away and connected to the HT being used as the transmitter.

Since the CAP repeater frequencies are far apart—148 MHz for transmit and 143 MHz for receive, virtually no desense from the antennas occurred when using 2 Watts from the transmitter. Some noise problems were encountered with both radios lying in the front seat beside each other, but this was quickly resolved by putting one radio on the back seat. Repeater performance was excellent.

The only real difficulty was educating some of the users, making them realize that this was an emergency repeater, and that their *voice* activated the transmitter, (as opposed to COR on the repeater back home). Once they grasped the concept all went fairly well, considering the 02AT takes almost a half second to lock in the VCO and transmit.

It is surprising how well VOX will work with some radios with electronic switching, where transmitter turn-on is nearly instantaneous. Only a fraction of the first syllable is lost, and with some receivers, the initial "thump" of the squelch opening is enough to key the transmitter without detecting voice. Other radios with computer controlled VCOs, however, take up to a half second for their transmitters to turn on, so try to avoid these as transmitters if possible. If they must be used, the HOT should be set to at least 5 seconds.

One of the arrangements I have made for a portable VOX repeater is simple and even somewhat crude, using my 2AT and another ham's 2AT or 02AT. I wired up a 15-pin edge connector for the board and used double-sided tape to attach a 2-inch speaker. A 10-inch shielded cable was soldered to the edge connector and a plug for transmitter audio and PTT was attached to the other end. Another shielded cable, about 25-feet long, was also soldered to the edge connector, and a plug attached for speaker audio from the other HT.

I attached the bare repeater controller board and edge connector to the "transmitter" HT with a rubber band. The ground wire from the repeater controller is attached to an alligator clip and clipped to the HT's BNC connector for ground. For the B+ wire, a small alligator clip is attached and clipped to the bottom of the HT's battery case, on the small battery charger contact screw. The small speaker taped to the edge connector puts a load on the repeater receiver's audio output. It also allows monitoring of the receiver to set proper transmitter audio levels via VR-1 and VOX threshold via VR-2.

On 2 meters, I use each radio's "rubber duck" antennas, and since there is no duplexer, vertical separation must be used to minimize receiver desense. With about 15 feet vertical separation, and using low transmitter power (about 300 mW.), very good results should be obtained if both radios are located somewhat high above the ground. For better results, higher power can be used, and an extension wire to the repeater's "receiver" radio must be used to allow better physical separation. The vertical and horizontal antenna separation, the distance between the two radios, and the amount of transmitter power used primarily determine the efficiency and range of this type of repeater.

Several rules of thumb should be observed if such a portable repeater is used:

•The Repeater Controller board should be closest to the transmitter but not directly adjacent to the antenna to avoid RF interference problems. Since audio is taken from the "receiver's" speaker output which is of a very low impedence, there is less chance of rf interference as compared to the higher transmit audio input impedence.

•Do not set the receiver's squelch at threshold—set it at least 1/8 of a full turn past threshold to compensate for battery drain and possible interference that could inadvertently key the transmitter. Since transmitter audio is taken from the speaker amp, keep the volume control at 1/3 to 1/2 open to assure linear frequency response.

•Use CMOS 555 timer ICs on the repeater controller board to minimize battery drain, and even clipping the resistors (R-19 and R-20) to the 2 LEDs will reduce drain further. A high capacity battery such as the BP-8 in both radios extends repeater life.

•The use of external antennas always works better, but vertical and horizontal separation may have to be increased. An excellent compromise is using quarter wave antennas on top of the HTs instead of rubber ducks. Vertical separation between antennas considerably out-performs horizontal separation when comparing performance versus actual distance between them.

•If using VOX, keep in mind that the operating voltage of the LM-386 determines its maximum audio output, and therefore determines the turn on of transistor Q-2. If battery power is being used, allow sufficient threshold to compensate for lower battery voltage by turning up VR-2 to more than its turn-on point.

•A UHF repeater of this type also performs well, and the same cables and connectors can be used if the same manufacturer's radios are being used. Since the frequency spacing between receive and transmit is relatively larger than on 2 meters, receiver desense may be less of a problem.

•Since, in all practicalities, an IDer can't be used in such a portable configuration, don't forget to ID the repeater.

A low-cost portable repeater can be constructed in a small plastic or metal carrying case. Although a metal one is ideal, a plastic one can be used if the HTs are mounted on a metal plate, with grounding braid attached to the HT's antenna connector for a good common rf ground. Each radio should be covered in its own metal housing such as an aluminum chassis for rf isolation. Keep all wires as short as possible, and use shielded wire for the power supply and repeater controller PCB connections.

An even better "portable" repeater configuration can be set up by connecting two separate vehicle-mounted mobile rigs together. The same rules should apply, but better performance can be expected because of better selectivity in mobile radio receivers, an excellent ground plane for vehicle-mounted antennas, and higher transmitter power. If sufficient distance between the cars cannot be achieved and receiver desense occurs, then transmitter power should be lowered.

Since a mobile radio has room for accessory interfacing, a connection to the squelch circuitry for COR can be located and tied into an accessory jack. This can be used to activate the transmitter rather than VOX, and make it sound much like a commercial repeater.

Keeping a spare repeater controller board in the shack can be a lifesaver if the club's repeater logic dies. In the meantime, it can be used for links, other emergency uses, and even for setting up a portable repeater to link home area hams visiting a distant hamfest.■

PARTS LIST FOR THE REPEATER CONTROLLER BOARD

Resistors

Quantity	Description	Where Used
2	10 Ohm, 1/4 Watt	R-5,6
2	1k, 1/4 Watt	R-19,20
1	2.2k, 1/4 Watt	R-17
1	4.7k, 1/4 Watt	R-2
8	10 k, 1/4 Watt	R-1,4,7,8,11,15,18,21
1	220k, 1/4 Watt	R-14
3	1 Meg, 1/4 Watt	R-9,10,13
1	4.7 Meg, 1/4 Watt	R-16
3	Select values, if used	R-3 = COR Voltage Divider
		R-11 = TX Key on audio line
		R-12 = TX audio low pass filter

Variable Resistors

VR-1, VR-2 — 10k, PC Mount

Capacitors

Except where noted, all capacitors are ceramic monolithic, in microfarads, and rated 16 volts or more.

Quantity	Description	Where Used
3	.001 ceramic monolithic or disk	C-2,15,18
5	.01 ceramic monolithic	C-4,8,9,14
3	.1 ceramic monolithic	C-1,11,13,16
1	2.2 tantalum	C-19
1	4.7 tantalum	C-7
2	22 electrolytic	C-3,5
1	22 tantalum	C-10
1	100 electrolytic	C-17
3	select values, if used (see text)	C-6 COR delay
		C-12 Low pass filter
		C-20 LM-386 gain

Transistors

Q-1 to Q-4	2N2222 or 2N3904
Q-5	2N2222 or 2N2904 transmitter keyup, 100 mA or less, 2N3053 for 100 mA to 750 mA

Diodes

CR-1 to CR-5 — 1N4148 or equivalent

Integrated Circuits

IC-1	4001 Quad NOR gate
IC-2	555 timer (or C555 CMOS Version)
IC-3	555 timer (or C555 CMOS Version)
IC-4	LM-386 400-mW audio amp
Voltage Regulator	MC-7805 to MC-7812, if needed (see text)

Switches

SW-1	SPST, miniature, toggle (Power On), PC mount, optional
SW-2	SPDT, with middle position off, miniature, toggle (PTT/OFF/TEST Tx) PC mount, vertical mount or 90-degree mount
DIP SW	DIP Switch, PC-mount, 4-Position

Miscellaneous Hardware

2 Miniature LEDs, PC Board, Edge Connector, IC sockets if desired.
A commercially manufactured, drilled and plated PC Board can be ordered from KA3AAQ, John K. Nally, 2934 Banks St. Harrisburg PA 17103, for $ 8.00 each, including shipping.

Paul M. Danzer N1II
2 Dawn Road
Norwalk CT 06851

Let the Computer Steer Your Beam

Interface your standard five-wire connected rotor with your VIC-20 computer.

Ham radio and computers seem to go together. If you ask most hams how they use their computer, they tell you they have software that will figure out almost any circuit calculation with Ohm's Law, and probably how they can run RTTY and AMTOR or Packet. Finally, they will say that someday—*someday* when they get around to it—they are going to tie their entire station together and run it through the computer.

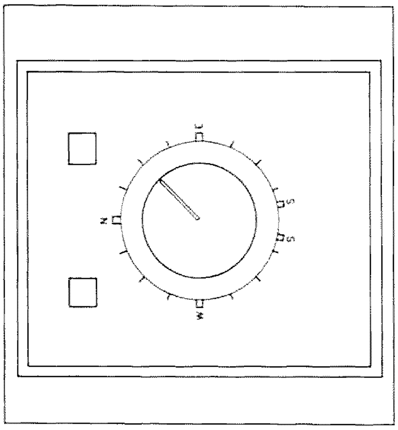


Fig. 1. Diagram of the rotor face.

Well, someday arrived here at N1II. I just couldn't stand having my little VIC-20 sitting around doing nothing most of the time. I decided to put it to work, and direct control of my triband antenna rotor was the result.

Start With an Analog Rotor

Like many other hams, I never bought a deluxe rotor. For many years, I used several identical models of an old standby, a five-wire connected rotor which I believe was first produced by RCA with a model number 10W707, with a selling price of $29.95. Later, Radio Shack sold it under several numbers, including 15-1220, at prices ranging from $39.95 to $60. I am told that Alliance sold similar models. In addition to the use of a 5-conductor cable, it can be recognized by a control unit that looks slightly like a rectangular pyramid with the top cut off, and a face similar to that in Figure 1. In addition to the manufacturer's logo, there is a single potentiometer control, and two small rectangular lights that go on to indicate the direction of rotation.

Although I selected this particular unit, the modifications can be applied to several other types of rotors controlled by a potentiometer geared to the motor, as well as a differential amplifier in the control head.

Since several hundred thousand of these little beauties were sold, the manufacturer must have had a pretty good design—and he did. The basic circuit is shown in Figure 2. When you turn the control pot R_C on the front panel the bridge circuit is unbalanced. The differential amplifier senses the imbalance and feeds back to drive the motor. Geared to

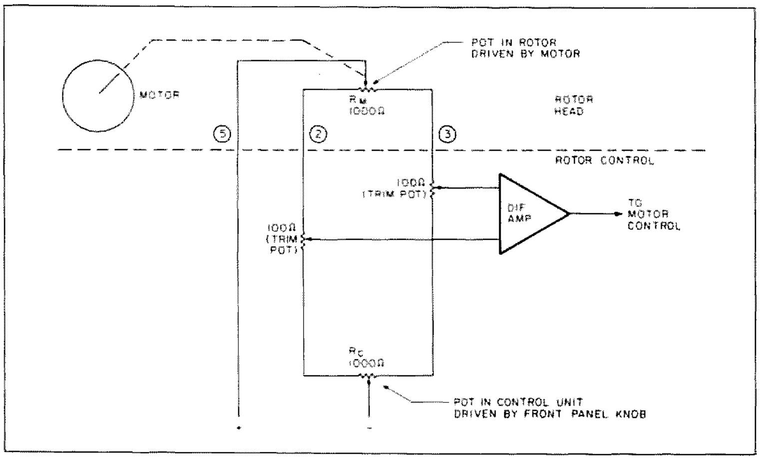


Fig. 2. Basic circuit of the five-wire connected rotor.

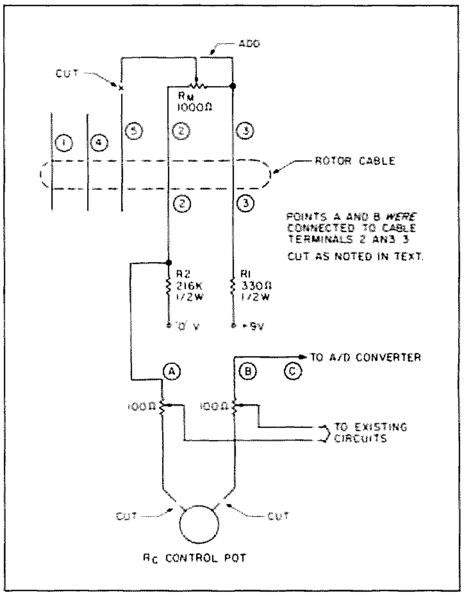


Fig. 3. The new bridge circuit.

LETTERS

Continued from page 9

yet, I have had my Spanish language QSOs interrupted by irate countrymen of mine who tried to insist that either I speak English or get off the air.

But you should know that nothing will change because the great majority of traffic handlers don't want things to change, and they are letting their directors know about it in no uncertain terms.

Before closing, I also wish to say that in emergencies close to home our repeaters seem to do a pretty good job. The fellows who keep those machines going, often through great expense and a lot of hard work, are to be congratulated. They have saved our reputation.

Fred Laun K3ZO
Nicaragua!

CUT WHAT?

If we are lamenting the loss of the electronics gold mine to the Japanese, we did that to ourselves. Back in 1963, I was employed by Univac and I recall management showing courteous Japanese businessmen our assembly line techniques. We had to "cut costs." I think the only thing we cut was our throats.

Ben Alabastro WA2PXR
Frankfort NY

NO PROBLEM

Wayne's September editorial comments that resident Novice expert, Bill Welsh W6DDB, says he hasn't seen anything to be happy about, so far, about Novice licensing figures. Yet, in this same issue, your page 8 Novice statistics indicate a sizeable increase in new license applications. I agree with this finding—our college classes are packed to the hilt this fall with the young and old wanting to get their beginner amateur radio Novice voice-class ticket. Our weekend classes have also been a sellout, and we have more students than our college classes can hold.

I believe Mr. Welsh may not be seeing the number of new candidates because he has not revised his outlook, nor his curriculum, to the new style amateur radio service. It's absolutely true that the newcomer is an appliance operator. It's also true that our new students couldn't begin to create any type of antenna system out of wires around an oatmeal container. However, the new breed of students will know all about packet, voice privileges on repeater bands, and will have good training on how to go on the air properly with their new privileges.

Our classroom sessions dazzle students with laser lights to illustrate propagation, containers of water to describe electromotive force, charged capacitors showing the effects of short circuits, and many demonstrations of equipment actually on the air. It's a whole new teaching game, and if we recognize that most students want to become communicators rather than electrical engineers, the process works fine.

Those organizations or individuals that don't see anything happening with Novice enhancement simply have a preconceived bad attitude about the whole idea. Let's not spoil it for the rest of us that are finding more students than we can teach, and more enthusiasm than we have seen in many years. Yes, the numbers are there!

Gordon West WB6NOA
Instructor,
Coastline Community College
Costa Mesa CA 92626

Continued on page 64

ENDS & ODDS

Ooops! October's Alden Weatherfax review ended on page 82—we neglected to mention that on page 19.

Moving! Bilal's Isotron Antennas for HF have moved to 137 Manchester Drive, Florissant CO 80816 (303/687-0650).

the motor is a second pot, R_M, and when the motor drives the pot to balance the bridge (and, incidentally, turn the antenna), the balance condition turns off the differential amplifier.

Note the terminal numbers 5, 2, and 3, shown in the figure. If terminal 5 wasn't also used for a motor voltage, you wouldn't have to touch the rotor at all, and all of the modification would be in the control head. However, as you will see shortly, a slight modification has to be made in the rotor.

New Bridge Circuit

The new bridge circuit is shown in Figure 3. After modification, +9 volts is sent through R1 and wire 3 to the pot, and the other end of the pot goes to R2 and then to zero volts. We are not using the term "ground" since this "zero" point is tied to the computer ground.

If you trace the printed circuit wiring in the rotor control head, you see that terminal 2 goes through a small 100-Ohm trimpot to one side of the original control pot, R_C. Cut the PC wiring from both ends of the control pot either with a small sharp knife or with a rotary grinding tool. The center of the trimpot is already connected to one side of the differential amplifier.

One end of the second trimpot goes to terminal 3, and the other end to the control pot R_C. Cut the printed wiring both at terminal 3 and at R_C, so that the trimpot now acts as a convenient connection point. It will later be wired to the digital-to-analog (D/A) converter (Figure 3).The voltage at terminal 2 now varies with the position of R_M, and is compared with the D/A output.

Fortunately, the rotor modification can be made without major disassembly of the rotor. The connecting terminal board on the rotor is held on by a single nut (Figure 4). When you remove the nut, the board drops out, and behind is the wiring to pot R_M.

There are two wires connected to the center terminal of the pot—remove them, solder them together, and tape the connection (Figure 5). Now add the jumper between the center of R_M and one end—don't waste time trying to figure out which end is which, since it doesn't make any difference. Replace the terminal board and its retaining nut, and you're finished with the rotor modifications.

The circuit I used is shown in Figure 6. It is a very simple A/D converter, built on a Radio Shack 176-170 experimenter's breadboard. There is not much precision involved, since you can recalibrate the system in the computer program. IC1 is the actual A/D converter and it is connected to the computer. IC2 is an amplifier with R6 used to set the low voltage limit (all "0"s from the computer), and R6 the gain so that all "1"s from the computer produces the voltage swing needed by the differential amplifier in the rotor control head.

The output of the circuit is connected back to point C in Figure 3. While I chose to build my own A/D, there are several low- cost microcircuits on the market which I could

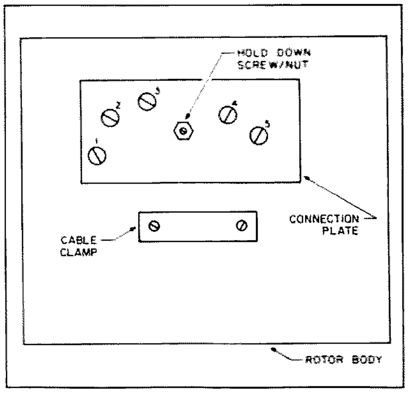


Fig. 4. The connecting rotor terminal board.

have used. However, I rarely have the patience to wait for long-distance parts and therefore usually use only items locally available. If you're a more patient type, you might look at the Signetics MC3410, listed for $9; or the ADC0803, 0804, or 0805 that start at $5.

Computer Connections

Since there is a VIC-20 in my ham shack, I connected to it by way of the "user port." I'm told that the Commodore 64-series computers use this same port with the same modem as the VIC-20, so what follows should also hold for the C-64 series. If you own another computer there are several alternatives discussed later.

Figure 7 shows how to connect the A/D to the VIC-20 user port. Again, on the basis of "use what you can get," I took a Radio Shack 276-1551 connector and cut it down from 44 pins to 24 pins with a few strokes of a hacksaw.

Put this connector face down on the bench and count to the thirteenth pair of pins from the left. Then, just to the right of this thirteenth pair of pins cut through the connector. Pull out the thirteenth pair with needle-nose

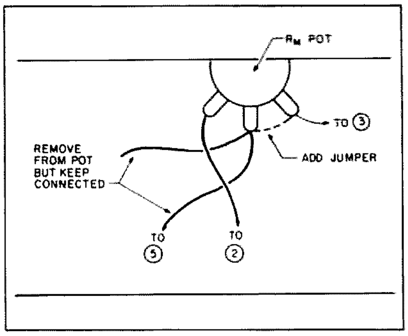


Fig. 5. Rotor modification.

pliers and you now have a perfectly usable 24-pin connector.

Pin wiring is shown in Figure 7, with the connections of pins A, C, D, E, F, H as shown to the resistors in Figure 6. Note that the omission of G is not a mistake. Notice also that pins M and N are used. These go through the little circuit in Figure 8 to the rotor control head. The best reference for this operation is a book called "VIC-20 Programmers' Reference Guide", sold by Commodore.

If you look at the top of the printed wiring board in the rotor control head, you see an insulated arm connected to the shaft of the control pot, R_C. When you turn the pot, this arm momentarily presses together the center and outside of a "U"-shaped assembly, that in turn applies 120 volts (line voltage) to the rotor control circuit. After this initial kick a relay closes, which keeps the 120 volts present until the bridge is balanced.

Since we are not going to mechanically rotate R_C, the circuit of Figure 8 substitutes for the mechanical closure of the contacts. The output of relay, RY1 is connected to the center and outside of the "U"-shaped contacts—be careful here, since you are now fooling with 120 volts. I built the circuit on a leftover piece of perf board, about 2 inches by 3 inches. I used a hot glue gun to melt glue

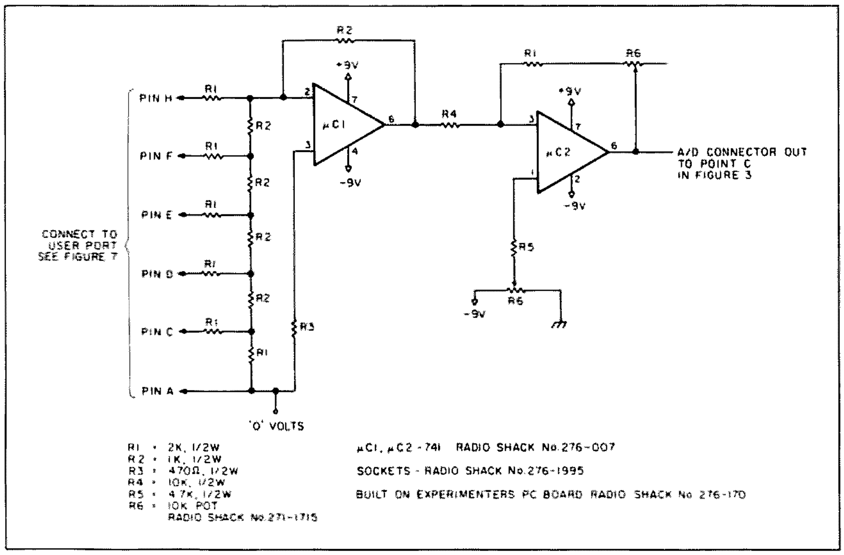


Fig. 6. Schematic for connecting the D/A to the VIC-20 user port.

over the bottom relay wires and the wires connecting to the contacts in the rotor, so that when I forgot myself—and picked up the energized circuit—the glue kept me from any shock. Again, the components here are not critical. Almost any decent NPN transistor will do, and if you cannot obtain a 9-volt relay such as the Radio Shack unit shown, use a 5-volt unit with a series resistor.

Construction

The A/D converter was built on a experimenter's breadboard and the switching circuit on a piece of perfboard. Connection to the computer is by way of a spare piece of ribbon cable since no critical signal timing is involved—just dc voltages.

Power was supplied by a pair of 9-volt supplies—in fact, batteries work fine for a short time. Notice that ground is never used. Both batteries or power supplies connect to the point labeled "0" volts, and this point is tied to the computer ground through the connecting cable.

The easiest way to calibrate the system is in pieces. Don't connect the computer and disconnect the A/D converter from Point C (Figure 3). Set up a variable voltage source with either an adjustable power supply or a 9-volt battery and a 1000-Ohm pot, to allow you to place a variable dc voltage on Point C, positive to C, and negative to the "0"-volt point.

Set the voltage to 0, plug the rotor control head into the ac line, and carefully momentarily short the "U" contacts (Figure 8) with an insulated jumper. The rotor will begin to turn and continue turning after you have removed the jumper. Finally, it will stop at one end. Now, adjust the voltage at point C until the front panel light goes out. This defines one end point, that we will call "true north." Measure and record this "true north" voltage.

Increase the voltage to 9 volts and again use the insulated jumper for a second or two. Again, when the rotor stops adjust the voltage on C until the light (this time it will be the other light) goes out. This is "wrong north." Measure and record the voltage.

Take the A/D converter, tie the input pins (C, D, E, F, and H) to "0" volts, apply power to it, and adjust R5 and R6 until the output of the converter reads the same as that

```
N ------|------ 0
        |
        |
        |       7
W ------|------
        |
        |
        |       15
S ------|------
        |
        |
        |       22
E ------|------
        |
        |
        |       31
N ------|------
DIRECTION SCALE          NUMBER SCALE
```

Fig. 9. Rough calibration. "0" is true north.

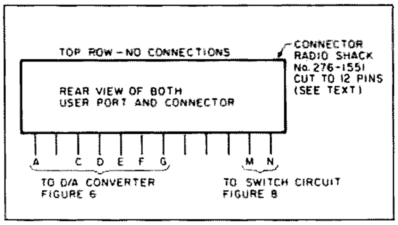


Fig. 7. Pin wiring.

measured for "true north." Next, connect the input pins to +4.5 volts (it does not have to be exact) and adjust R5 and R6 to the voltage of "wrong north." Repeat these two steps until you produce both voltages. Finally, hook the A/D converter to the computer, load in the program, and retrim the circuit by entering 0 degrees and 360 degrees alternately at the keyboard. You will probably have to trim it up again when you connect to the rotor control unit. Figure 9 illustrates these steps.

The system is set up to use 5 inputs, or a 5-bit binary word. In binary this ranges from all zeros (true north) to all 1s or a count of 31 (the wrong north). From the number scale 0 is set to north, near 7 is west, near 15 is south, and so on. The divisions are not exact and the ideal would be to set the "all ones" or 31 to be a rotation just short of "wrong south."

Incidentally, if this sounds confusing—or if you feel that you have been going around in circles—compare the rotor panel in Figure 1 with the scale in Figure 9. The manufacturer sets up the system to swing from south *through north* and back to south. He also supplies little paste-on labels so if you want to mount the rotor 180 degrees rotated, as I usually do, then the rotor will swing from north *through south* and back to north. Since I've found this much more convenient I set this computer system up this way—you can change it if you prefer.

Figure 10 explains the short program needed for the VIC-20, and the program in BASIC, is given in Figure 11. Step 45 is the

```
This listing explains the purpose of each program step of
     Figure 11.

20   SETS THE USER PORT TO OUTPUT
30   GET THE DIRECTION IN DEGREES FROM THE KEYBOARD, STORE
          IT AS VALUE 'A'
40   CONVERT THE DIRECTION IN DEGREES TO A COUNT FROM
          0 TO 31, THEN ROUND IT OFF TO A WHOLE NUMBER.
          THIS IS STORED AS VALUE 'B'.
45   THIS STEP DOES NOT EXIST IN THE LISTING OF FIGURE 11,
          BUT IT IS THE PLACE YOU WOULD INSERT FINE
          CALIBRATION (SEE THE TEXT).
50   SEND THE VALUE 'B' TO THE OUTPUT PORT, WHERE IT SHOWS
          UP AS A 5 BIT BINARY NUMBER.
60   PUT LOGIC "1" OR +5 VOLTS ON PIN M OF THE USER PORT
70   PRINTS THE WORD "ON" ON THE SCREEN TO TELL YOU THE
          TIMING CIRCUIT IS WORKING
80   THIS SETS UP A DELAY LOOP TO KILL A SECOND OR TWO
90   THE REST OF THE DELAY LOOP
100  PRINTS THE WORD "OFF" TO TELL YOU THE TIMER WORKED
110  RESETS PIN M OF THE USER PORT TO 0 VOLTS
120  SENDS YOU BACK TO STEP 30 TO GET ANOTHER INPUT
          IF YOU WANT TO CHANGE THE DIRECTION
```

Fig. 10. Program flow, in BASIC, for the VIC-20.

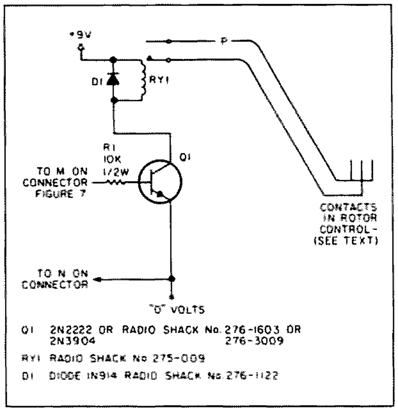


Fig. 8. Relay circuit to maintain current to rotate the rotor until the bridge circuit is balanced.

point to insert fine calibration. Depending on how accurate you want to be, you might want to write a short program which fixes any errors in the A/D converter, although with a beam that has a 15 or 20 degree beamwidth, it hardly seems to pay. On the other hand, if you have a lot of patience, you might eliminate steps 20 through 45 and substitute a table look-up of country prefix vs. direction. Anyone with the patience to do this, please send me a copy.

Although I used a VIC-20 and its output port for the computer, the idea could be adapted to other computers. The Apple game port has four outputs, and by using it in two banks, the same effect could be obtained. Alternately, an AY-3-1015D UART chip could be set up to accept RS-232 from any computer's serial port, and the parallel output of the chip used for 5 bits of data and one bit for control of the rotor 120-volt contacts.

Other rotors can also be used—the basic requirement is the ability to get into a pot on the rotor and the differential amplifier on the rotor control head.

Give it a try, and good luck.

```
10   REM  CORE PROGRAM BY N1II
20   POKE 37138,255
30   INPUT "DIRECTION";A
40   B = INT(A/12)
50   POKE 37136,B
60   POKE 37148,255
70   PRINT "ON"
80   FOR I = 1 TO 1000
90   NEXT I
100  POKE 37148,223
110  PRINT "OFF"
120  RUN 30
```

Fig. 11. The program listing for Figure 10.

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Last month I presented a letter from Larry Morgan K7LX, in which he presented some views on the AEA PK-232 data controller. I sent his letter to AEA for comments, and received a response from Mike Lamb, the president of AEA, which I would like to share with you all. Mike writes:

"Thank you for the opportunity to respond to Larry Morgan's comments regarding the AEA

"Yes, RTTY has sidebands."

Pakratt™ Model PK-232 multimode data controller.

"I have recently spoken with Larry by telephone and have determined that he had used a friend's PK-232 which had very early firmware releases. Initial firmware releases did, indeed, have a few AMTOR idiosyncrasies that have since been changed in January, 1987, and March, 1987, firmware releases. At the same time, we also added other enhancements such as weather FAX and the SIAM™ features.

"The PK-232 is factory adjusted for 200-Hz shift AFSK transmit tones. If someone is bothered by this, they can easily adjust two potentiometers for 170-Hz AFSK shift. However, as you will note by the enclosed bulletin (printed below) written by Dr. Alan Chandler K6RFK, it is virtually impossible for the average user to measure any signal degradation caused by a 170-Hz/200-Hz shift difference.

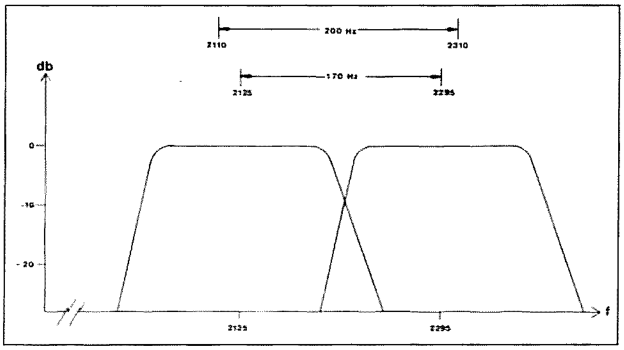
"The PK-232 has a unique modem design that uses the best traits of both AM and FM FSK detection. FM detection allows for easy operator tuning over a wide range of tone shifts. AM detection typically offers better weak signal detection than FM. The PK-232 uses an FM design with Automatic Threshold Correction (ATC) that offers weak signal detection similar to an AM detector. The PK-232 200-Hz receive shift (HF) mode actually sets up the internal demodulator for copying ANY FSK shift from about 85 Hz to 500 Hz (centered around 2210 Hz). The 1000-Hz receive shift (VHF) mode actually allows copy of any FSK shift from about 400 Hz to 1500 Hz (centered around 1700 Hz)."

I thank Mike for his letter, and would like to point out that the PK-232 I am using, as noted last time, does possess the latest, March, 1987, firmware. Let's look at that bulletin on shifts he mentioned. Alan Chandler K6RFK wrote this article, which comes to us through the courtesy of AEA.

200-Hz Shift on HF Baudot?

In the early days of RTTY, the difference between the mark and space tone (the shift) was 850 Hz. The wide shift has some advantages on HF as well as one primary disadvantage. The disadvantage is the bandwidth required—850 Hz plus the modulation sidebands (yes, RTTY has sidebands!). The advantages are that the wide spacing compensated for selective fading and the lack of stability of the transmitters and receivers used at the time. As the FCC allowed narrow shift and the stability of the radios improved, 180 and 170 Hz shifts became common with 170 finally becoming the standard. Along came HF packet and a new standard was born: 200 Hz. Can a station using 170-Hz RTTY communicate with a station using 200-Hz RTTY without problems? In a word, YES!

In order to pass the information sidebands, the RTTY channel filters (in an AM demodulator) need to be at least 67- Hz wide and are typically 150-Hz wide. For the FM style demodulator, the input bandpass filter should be at least 350-Hz wide. Both bandwidths assume 45-baud signaling rate. Higher baud rates require larger information bandwidths. When two stations are using the two shifts and are tuned to the same center frequency, the maximum offset in mark or space is only 15 Hz. That is, the difference in shifts is divided between both tones. Even with the sharpest channel filters, the information bandwidth required of the filter will easily allow a 15-Hz offset in the AM demodulators and the Q required of the discriminator in the FM demodulators will also easily pass the extra shift. The same works in reverse. The 200-Hz shift receiving system does have a wider noise bandwidth than a 170 Hz receiving system. This is due to the wider bandwidth filters necessary for 110- and 300-baud operation, for the different shift. At 300 baud, the 200-Hz shift actually has a small advantage over the 170-Hz systems. If someone tells you 170-Hz and 200-Hz shift are incompatible, you are having one of your legs pulled.



Typical Channel Filters

My sincere thanks again to Mike Lamb of AEA, for sharing this piece by Dr. Alan Chandler with us.

AMTOR does have the spotlight this month, and here is another heard voice. Bill Martin, R.Ph. N7EU, of Bothell, Washington, drops his response to many questions raised here. Bill says: "I am an avid AMTORite. I think the main problem I see with new modes like AMTOR is that the fellahs are a bit intimidated by this mode. RTTY is easy compared to AMTOR. You kick on the transmitter and the most difficult part may be getting the other station tuned in properly and getting the tones right-side up. With AMTOR, a lot more is going on, such as linking, time intervals between receive and transmit, different rigs reacting or interfacing with the AMTOR program, or FEC and ARQ modes. Maybe what we need is an article with an overview of AMTOR and its advantages and difficulties discussed. Surely the 100 percent copy is one advantage over RTTY—and the ability to run lower power and still maintain a conversation. And conversation is the key. HF packet seems to have some problems. The operators I have spoken to seem to be dissatisfied with the speed or flow of conversation. In any event, count me in on any AMTOR cheering squad. I use it more now than regular RTTY.

"And still one more little comment about RTTY operating in general. Why are RTTY operators such sticks in the mud when it comes to operating on different bands? There are only two places you will find RTTY used—14.080 to 14.100, and 3.600 to 3.640. Windows for packet and AMTOR are: 14.070 to 14.080 (AMTOR); 14.100 to 14.110 (packet); and 3.640 to 3.650 (AMTOR). This does not make any sense to me. Forty meters is a terrific daytime band for RTTY, but try to find someone there. Also, the 15- and 10-meters band have been opening up, but I have worked only three fellahs on ten meters with RTTY. They got discouraged and left after fruitless tries. So why do these operators jam themselves together in as little spectrum as possible? Let's see a little more activity in the other bands as well. And the excuse that the band is dead is not valid. Many a time I have worked ten meters when it sounded dead—at times as late as 11 p.m. into California. I think a real push should be made to get some sort of calling frequency going on the ten-meter novice band. I have been using 28.190. Any suggestions? If we want to get the novices interested in digital modes, it would seem to

"The PK-232 has a unique modem design that uses the best traits of both AM and FM FSK detection."

RTTY Loop

Continued from page 53

me that ten meters would be a natural."

Bill raises some excellent points. I often wondered myself why there's so much clustering. At one time, with rocks (crystals) and drifting VFOs, it may have made sense, but now? And as far as the other bands, why not? As they say, use it or lose it—right? I would love to hear all your thoughts on these, or any other, RTTY points.

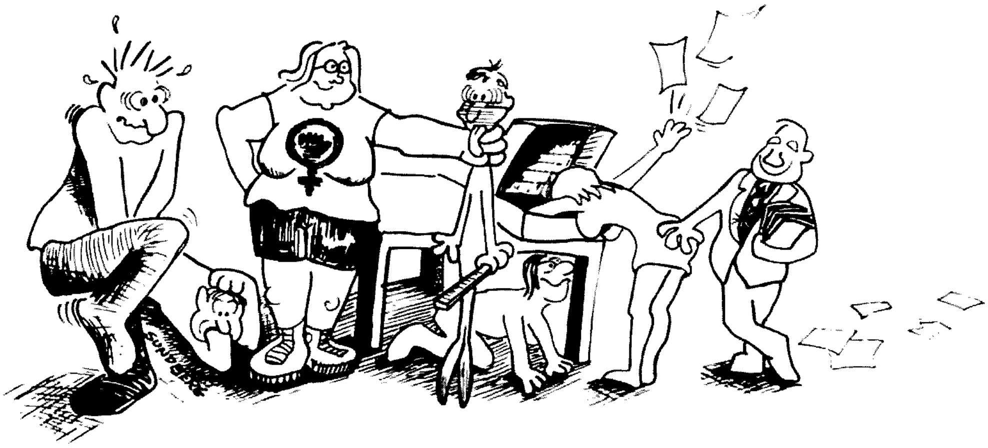
On the question of an overview-type article on AMTOR, such a topic was presented in RTTY Loop some time ago. In response to the numerous questions I have received asking what has been covered in the more than ten years of this column, I have prepared a RTTY Loop index. If you would like to see what we have been talking about, drop me a self-addressed, stamped envelope, to the address at the head of this column, with postage for two ounces on it, and I will send you a copy of this index, updated to the current published issue of RTTY Loop. Information on obtaining individual columns will be included with the index.

I hope to be a bit more visible on the HF bands, after my antenna-installing adventures this summer. After stalling for some time, and cutting down a dead tree that stood in the way, I finally used a bow and arrow to shoot a line over a tree about a quarter wavelength (on eighty) away from the house. Rope followed line, and antenna followed rope, of course, and the thing loads well through a tuner on all bands. So, as time permits, I hope to pop up on HF bands on an irregular basis.

More reliable modes of communication with me remain the mail (remember to send a SASE if you desire a reply), CompuServe (75036,2501), and Delphi (MARCWA3AJR). If all's well, next month should bring our annual feature, and more goodies right here.

This story by Bob Manning K1YSD of Rye, NH, appeared in the December 1973 issue of 73. We reprint it as a tribute to Bob, now a silent key.

The Greenie



An account of a brief and tempestuous contest

The Wayne Green Award, or *Greenie*, came into existence in much the same way as did penicillin, the St. Andreas Fault, and *me*—by sheer accident!

Recently, an obscure and nameless ham with the solder-wasting, foot-scarring and improbable talent of constructing breadboards with a propane torch, discovered his solder had been dropping into a scrunched-up, cast-off TV dinner plate secreted under his bench.

When—after several pounds had accumulated—the mass was removed and turned upright, it bore not only an amazing resemblance to Wayne Green (dutch boy haircut, turtleneck sweater and all), but two embossed letters, *E* and *L*, from the plate had been reversed fashioned into the glop somehow, making a passable *73*. Thus the Greenie was born!

Its destiny was to be awarded to the ham with the best or most unusual shack.

We (the awards committee), after visiting hundreds of shacks, were gathered in the huge 8 x 10 ft. conference room to decide who should receive the coveted first annual Wayne Green Shack of the Year Award (no double entendre intended!).

To say it was an odd assemblage would be putting it mildly. It was, however, fairly representative. Wayne, himself, was in absentia, having gone off to fight simultaneous duels with the editors of *CQ* and *QST* (FCC Proposals at 300 meters).

Katrina of course was there, representing the YLs. Slightly over 300 pounds of Fem-Lib amateur radio operator, Katrina was, to say the least, imposing. A feminist to the last ounce, Katrina, at the moment, was banging alternately on the simulated alabaster (plywood) table (Wayne spares no expense) and thumping Claude Zister, our technical type, on his emaciated chest, causing him to retch violently at each thump.

Claude isn't a bad sort, despite the fact that he and the slide rule he kept clutched in his bony fist were of unusually similar stature and weight. Only guy I ever knew who made Wally Cox and Twiggy look like Minnesota Fats and Mama Cass Elliot!

"It's gotta be a YL or XYL to win the award!" bellowed Katrina. "You male chauvinists have had it too much your own way for too long."

"Balls!" roared Grunt (at least I think his name was Grunt. He barely spoke below 721 dB over S-9 which, when we first met, numbed my eardrums and I never was sure of what he'd said when he'd introduced himself).

During our inspection tour he yelled into one guy's mike so loudly and so excitedly that he bit the top right off a Shure 444. Grunt was the representative of that new breed operation. The SuperHam! You've undoubtedly met them on the bands.

The SuperHam comes through, on the air,

> **"Funny, I never did get used to Cecil's attire."**

as a fiftyish, loudmouthed, know-it-all clot dedicated to the proposition that only *he* is created equal. He claims squatters rights to *his* frequency, and by virtue of thirty-two series paralleled 4-1000Z's simply opens up and takes over at least 20 kHz of band width. Faster than a millisecond VOX, more powerful than the law allows, able to stomp QRP stations with a single belch. Ooh hoo! Look! There on the air! It's Aurora! It's insane! It's SOOOOPPERHAAAAMM!!!

"And again I say Balls!" roared Grunt. "It's gotta be a station with power, power, P.O.W.E.R. power and more power!"

At this point our secretary, Maggie (the message handler) began rummaging through an oversized Samsonite suitcase, the outside of which boasted (instead of travel decals) stick-on message check-off sheets, HX and ARL numbered references. "Wait a minute. I've got some notes here," she said, scattering message forms and blanks over her shoulder, the table, and the floor.

"Yeah! Hold it!" chimed in Cecil, the certificate hunter, performing a similar act save for the fact that he was strewing certificates hither and yon. (Funny, I never did get used to Cecil's attire: the single breasted oversized WAS certificate for a jacket made from seersucker was bad. The bell bottoms fashioned from quilted CHC memorabilia was worse, but the tie that glowed in the dark showing his DXCC made me feel like someone was stepping on my throat.)

From the corner, Effram, our CW operator, was bleating, "Didah dididit, didah dididit."

Looking up from my navel (which, incidentally, in the last five years has gone from the outward type to the inward type), I began to pound my gavel for order. I, as the appliance operator-klutz-lid representative, was the chairman of this motley group.

"Order, order!" I screamed at the room, which had taken on the appearance of a ticker tape parade due to the fact that Maggie and Cecil were still flinging papers into the air. Katrina was hollering "YL, YL, YL!". Grunt was bellowing, "Balls! Power-power-power I tell ya - ya gotta have power!" and Effram was driving me slightly off my rocker with that "didah dididit, didah didit!" It sounded like a Chinese auctioneer with a cleft palate conducting a sing-along for 200 babbling tambourine thumping chimpanzees.

Bang, Bang, Bang

Bang, bang, bang went the gavel as I pounded at the chaos. Suddenly I felt several sharp pains just below my spleen and discovered Claude poking me with his slide rule. "Excuse me sir," he said, "but I believe you've just spilled your coffee into your lap."

"Thank God!" I exclaimed, "I thought it was something else."

Some semblance of order finally arrived except for Effram with his "didah dididit" and "dahdahdidah dah dahdidahdit."

"Grunt," I said, "will you put Effram on break-in and tell him to QRT."

"Huh? Whazzat, boy? You gotta speak up, boy! You need more power. More power, I say. Power, boy slap the ole juice to it till the tubes run rosy red and the transformer fires—power, boy, power!"

Thankfully, Katrina took a hand and solved the problem with delicate feminine expertise. Clamping onto Effram's hand containing a soup spoon with which he was tappy-tappy-tapping something, she jammed both spoon and hand down his throat, coming dangerously close to his liver. Then, in what seemed to be single motion, she grabbed Maggie's oversized attache case, and with a vicious arced swing whomped Grunt approximately 32 inches above his ankles, or at the apex of his V, as we say in the trade.

"Okay," I continued, "now we only got this one trophy to give away. We've seen all sorts of shacks. Suppose we use the process of elimination? I think we can eliminate all the Danish Modern, Colonial and home-antiqued types, right? Any other eliminations? Raise your hands."

A sharp shooting pain under my left eye told me that Claude had raised his hand, replete with slide rule, damn near turning me into a cyclops.

"I think," said Claude, "that we can also eliminate the Japanese Contemporary shack. I mean, after all, 'Ladio Shack?' 'Landom Rength of LG/8U' and 'Loger, Loger OM' is a bit much; besides, the autographed 8 x 10 glossies of Sessue Hayakawa and Richard Loo in bamboo frames? Pfuii!. And how many operators will deliberately live on the side of a hill so they can erect slanted inverted vee's?

"And it didn't got no power neither. No balls at all," chimed in a slightly falsetto Grunt, assuming a cross-legged protective pose as he cast a suspicious eye at Katrina.

"Yeah, and it was all commercial. He didn't have no home brew stuff anywhere!" came a voice from under the table.

"Who the hell is *that*?" I gasped, as a pair of hands and two eyes peered over the tabletop.

"Tis I, Marvin, the home brew specialist."

"Whatinhell are ya doin' under the table, Marvin, the home brew specialist?"

"I'm building a voting machine," Marvin replied, piling soldering gun, heat sinks, dikes and assorted other tools on top of a stack of Maggie's messages and Cecil's certificates.

"Look, old boy, I think I soldered my belt buckle to a table hinge, so I'll just sit here, okay?"

"Fer cripes sakes. Is that everybody?" I said, glancing around the room and under the table, absently noting that Marvin had, indeed, soldered his belt buckle to the table hinge.

"I believe," said Claude, manipulating his slide rule back and forth and making copious notes on a seemingly endless sheet of foolscap, "that we're missing one-point-three persons."

"Whaddya mean, one *point* three persons?"

"Well, Baltimore-Anchorage-Roanoke-Rochester-Yokahama—what a name—the 20 meter, quick QSO kook was captured by an A&P manager and is working the five-items-or-less checkout counter around the corner. He was 'Hi there! You're 5 and 9—that's a dollar 9.80 see you latering' to beat the band the last time I saw him."

"Okay," I said, "That's one—now what's the point three?"

"Oh, that's Giggles. You can't really call him a full ham. I don't know what category he falls into. He's the fruitcake who checks into a net and spends the next 45 minutes tripping his VOX with giggles."

"I know the type. Thanks, Claude."

"Think nothing of it," said Claude, making a magnanimous arm-sweeping gesture, catching me across the bridge of the nose with that goddam ruler.

"We're missing 1.3 persons."

"I think you just deviated my septum, you....."

"Dididídit didit" "Dididídit didit" came from the end of the table.

"Claude, why don't you go down and teach semaphore to Effram and take that mathematical pogo stick with you." I said, wiping a tear from my eye and a spot of blood from my nose.

The Process of Elimination

"Okay, any more eliminations?"

Katrina jumped to her feet (this act by its sheer spontaneity caused Grunt to explode backward against the wall—not an easy feat when you're in a 'September Morn' pose). "I think," said Katrina, casting a threatening look at the folded-up Grunt, "that we ought to eliminate that Swedish Convertible shack also. Really! A Myra Breckenridge receiver and a Christine Jorgensen transmitter. That's carrying synthesis too far. No knobs, no meters no dials, no nothin', just *one big switch* —or is that *swish*?"

"And it didn't got no power at all. Ya gotta have oomph, guts, punch. Ya gotta have balls!" said Grunt.

"I agree," said Claude, "the absence of a ball bearing drive mechanism on the vfo renders it virtually useless, and I think Effram will agree that a 'marshmallow key' for limp wrists is impractical. Right, Effram?"

"Didahdit didahdit" said Effram.

Just then a "giggle giggle" came from the intercom.

"Giggles, will you get the hell outta the waiting room, quit giggling into that intercom, and join us?"

"Right, Bob-giggle-giggle—but ya know I sort of liked that 'Liberal' shack we saw. You know the one—entire place bedecked hippie style with flowers, beads and black lights using a Lysergic 25 receiver, MaryJane transmitter and a Horse Amplifier—hey, and the wattmeter labeled 'Flower Power', log books called a 'trip sheet' and all those petitions. Like the one petitioning all magazines to include a supplement to their "Who's Who" columns entitled "Who Dat?" and that jazzy antenna erected in the form of a 65 foot peace symbol. That's today, Bob!"

"Charlie, Charlie" said Maggie.

"According to my calculations, the damned thing won't work, Giggles!" said Claude.

"Precisely! It's IN" said Giggles.

"Balls!" said Grunt.

"Do I record all this talk as one message or can I count each quote as a separate message?" asked Maggie.

"Hey, yeah! And do I get a certificate for attending this thing?" queried Cecil.

"Look, we're here to hand out this trophy. Now with the Emmys, Oscars, Grammys, and all the other awards handed out, it's pretty hard to go through a liftime without receiving an award!"

"You're right, Bob. I know a guy who got an award for never having received an award!"

"Look, Marvin," I said, "if you can unsolder your belt buckle without doing yourself any permanent genetic injury, will you get up above the edge of the table, and we'll get this thing settled.

"Now," I began, "as I see it, in order to please everyone, we've got to give it to a YL running in excess of 10 KW on CW for quickie QSO's on 20 meters who receives an occasional BPL, has a good standing in the CHC and has built her entire shack in Early Halloween or Contemporary Junkyard all by herself and can giggle her VOX on phone, right?"

"Oh, Lord," I said. "Well, Wayne's always saying to get the lead out."

"Giggle, giggle."

"Maybe we could build a parabolic dish out of it," said Marvin.

"Put a number on it so I can log it," said Maggie.

"Hell, let's stamp BPL on it and GIVE it to Maggie," said Katrina.

"Can I keep it as a certificate," asked Cecil.

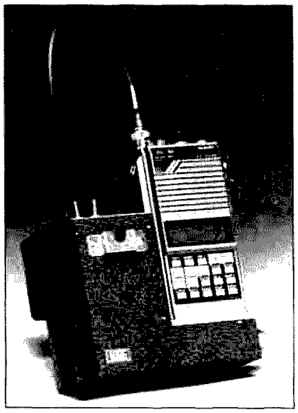
"With extreme calm, I walked to the window and threw the melted glob, my gavel, the buckle-spoon-ruler combination and two handfuls of messages and certificates into the street. Then, as an afterthought, I picked up the still "dididídit didit - didididi didit"ing Effram and flung him after his spoon, receiving the ultimate satisfaction of hearing him speak his first real word "HHEELLLLLLLPP!!!"

"Oh, Lord!"

"Balls!" said Grunt, Katrina, Maggie, Marvin, Cecil, Giggles, and I in unison. And, from the sidewalk, we heard "didahdit" thus putting an epitaph to the Greenie. ■

NEW PRODUCTS

Compiled by Rebecca Niemela



Dual Band Docking Booster from Naval Electronics.

DUAL BAND DOCKING BOOSTER

The new FT727 docking booster puts out 30 Watts on VHF and 18 Watts on UHF. It automatically senses the band selected by the HT and switches in the appropriate PA and GaAs FET pre-amplifier. The booster clips to car doors via a clip and connects to the car battery and roof antenna.

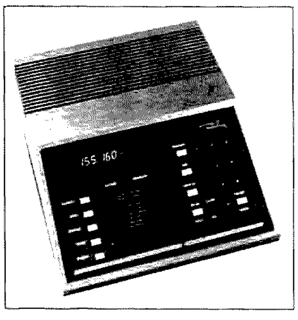
The FLT727 booster is compatible with Yaesu's single band HTs such as the FT203, 209, 703 and 709.

For further information, contact Naval Electronics, 5417 Jetview Circle, Tampa FL 33634 (813/885-6091) or circle Reader Service Card #205.

THE REGENCY R1080

A moderately-priced programmable scanner that features search, weather scan and a priority channel has been announced by Regency Electronics.

The Regency R1080 features 30 channels and six of the most popular UHF and VHF ranges, including VHF-Low (30-50 MHz), VHF-Amateur (144-148 MHz), VHF-High (148-174 MHz), UHF-Amateur (440-450) MHz), UHF (450-479 MHz) and UHF-T (470-512 MHz). Thirty of the most popular frequencies are preprogrammed at the factory so that the unit can be operated right out of the box.



The Regency R1080 from Regency Electronics.

The scanner can be programmed to scan as many as 30 channels, or search entire frequency ranges to find active new frequencies. When the "weather scan" key is pressed, the scanner automatically searches all National Weather Service frequencies to find the active frequency in seconds. If a transmission is noted on the priority channel, it will automatically switch to the channel so that important transmissions are not missed.

Other features include channel lockout, for skipping channels not of current interest, fast and slow scan speeds and a memory backup system that uses a capacitor instead of batteries to save frequencies during power outages and when the scanner is unplugged. The price is $199 with a one-year warranty.

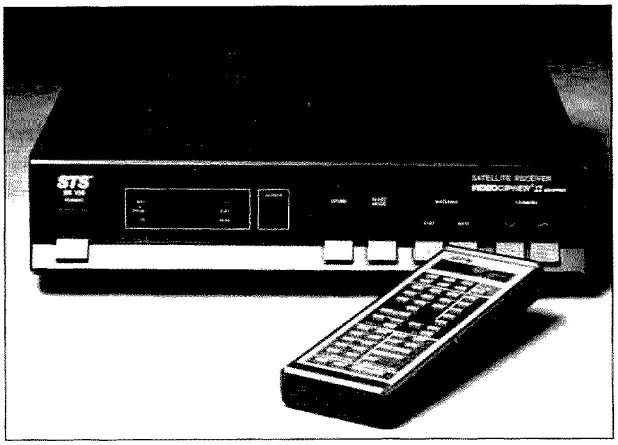
For further information, contact Regency Electronics Inc., 77077 Records Street, Indianapolis IN 46226 or circle Reader Service Card #201.

SR 100 AND SMART REMOTE

Satellite Technology Services, Inc. has begun marketing its new SR 100 receiver and a companion remote control unit, the Smart Remote programmable controller.

The STS SR 100 is an integrated receiver descrambler (IRD) with features that include full stereo, matrix discrete and digital when accessing Videocipher II descramble channels, full on-screen graphics (not just on VideoCipher II descrambled channels) and 34 favorite program recall. With the capability of storing up to 54 satellite locations and 7 pre-programmed polarity formats, the SR 100 is the most C/Ku friendly receiver available today.

All system functions can be operated by the new Smart Remote programmable controller.



SR 100 and Smart Remote from Satellite Tech.

The STS Smart Remote programmable controller offers the capability of operating every infrared remote component in a home entertainment system, regardless of brand, with a single control unit. The Smart Remote is capable of learning the operating codes of different infra-red remote control units. It is this unique feature that enables the unit to operate any mix of remote controlled TVs, VCRs, compact disc systems or stereo receivers. The STS Smart Remote programmable controller can be easily programmed by the consumer even if that person has little or no experience with high technology equipment. Programming and operating is further simplified with the aid of the Smart Remote's built in liquid crystal display.

For more information, contact Satellite Technology Services, Inc., 11600 Lilburn Park Road, St. Louis MO 63146 (314/567-0304) or circle Reader Service Card #207.

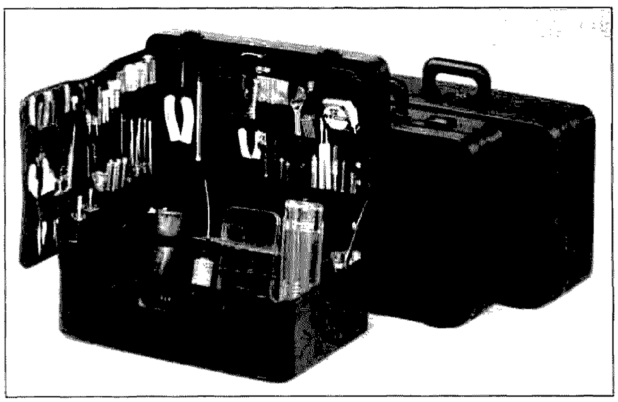
ROTA-LUX AND ROTA-TOUGH

Jensen Tool Inc. has introduced two tough new tool cases. Rotationally molded of high-density polyethylene, thicker at corners and edges, and formed without stress points, these cases are engineered to last a lifetime. The cases are now an available option for Jensen's leading tool kits, including the top-of-the-line JTK-87 Electronic Service Kit for field service engineers.

Rota-Lux and Rota-Tough cases vary slightly in size and styling. All Rota-Lux cases measure 17¾" x 12¾"; Rota-Tough, 17¾" x 14¾". A total of five models is available in differing depth dimensions from 5" to 10".

Available only from Jensen Tools, these cases are now an option for the JTK-87 Electronic Engineer's Tool Kits, and for the JTK-17, 11, 54, 75 and 76 kits. Other kits may be adapted to Rota-Lux and Rota-Tough cases by special request.

For more information and free catalog, write or call Jensen Tools, 7815 S. 46th Street, Phoenix AZ 85044 (602/968-6231) or circle Reader Service Card #202.



Tool Cases by Jensen Tool.

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free, on a space available basis. To make our job easier and to ensure your listing is correct, please type or print your request clearly on a full (8-½ x 11) sheet of paper. Double-space and use upper- and lowercase letters where appropriate.

Also, write numbers carefully—a 1, for example, can be read as an l or an i or a 7 as a 1. Thanks for your cooperation.

Wanted: Manuals/schematics or copies, for the following; Heath SB-101, Paco C20 resistance/capacitor bridge, Wawasee swr/Watt Digital frequency readout, Dentron Supertuner antenna tuner, RCA Mastervoltohmist, National 240D Receiver, also original meter for E.F.Johnson antenna tuner (250 Watt), Digital frequency readout for Heath HW-101.

A.Campo
816 West Knapp St.
Rice Lake WI 54868

I am looking for a Webster (or Sears, made by Webster) wire recorder/player, any condition, preferably working. I need to transfer about 30 reels of wire to cassette. Any reasonable price paid and any information greatly appreciated.

Bill Nohrn W5UNB
8820 James NE
Albuquerque, NM 87111

I need an owner's manual (copy) or schematic for an Allied model A-2509 Shortwave Receiver. I'll pay for reasonable charges.

Ted Osborn WN9PIQ
30 Lamm St.
Danville IL 61832

ABOVE AND BEYOND

VHF and UHF Operation

Peter H. Putman KT2B
3353 Fieldstone Dr.
Doylestown PA 18901

FALLING OUT OF AUTUMN

(Wolfe Island, Ontario, Canada) As you read this, the leaves are falling (or have fallen), the air has taken on a chill, and hopefully the tropo activity has been above average. As I write this, however, it's still the "dog days" of August, with a steady breeze blowing over this relaxed site on the Canadian Channel of the St. Lawrence River, in grid square FN14.

Yours Truly effected a move to Pennsylvania back in May with the intention of expanding my real estate holdings and pursuing a somewhat more rural existence. Not the least of my considerations was a better site for VHF and UHF activity, but the demands of moving, remodeling, and a lot of business travel put the station equipment and antennas in cold storage for longer than I care to admit.

However, now being possessed of one acre of land, I decided to take the plunge and install a new tower—specifically, the W-51 manufactured by Tri-Ex of Visalia, California. This particular unit is a three-section crank-up type, measuring about 20 feet when fully collapsed, and 51' 3", when fully extended. It's rated at 9 square feet windload with the proper anchorage, and checks in at about 400 pounds. Many of my contemporaries had considerable success with similar units, especially while using Belden type 9913 RG-8 cables for VHF and UHF feedlines.

I had employed a variety of antenna support systems at my old residence in New Jersey—roof towers, chimney supports, house brackets and a 40-foot fixed tower commonly used for TV antennas. As the system expanded, so did the number of antennas and linear feet of coax pressed into service. In short, my antenna system grew out of control like some crazy vine as each new band or antenna was added! Shortly before the sale of my house, I had 16 antennas and over 1400 feet of coax in service, not to mention various dead-ended runs of old CATV hardline and worn-out rotor control cables.

Mixed Blessing

Buying a house can be a mixed blessing. After all, you do agree to pay an unearthly sum each month to your bank for the privilege of owning one, maintaining the building and grounds, and paying taxes and insurance on top of it all. On the other hand, if you happen to be a diehard VHF/UHF operator, a new house looks more like a "clean slate" from which all of your previous mistakes, failed arrays, coaxial Gordian knots, and hare-brained guying jobs have been erased. Like the prisoner on parole, you have a chance to set the record straight and start all over again.

I made the most of this golden opportunity by doing absolutely nothing about it for the first two months, which my wife considered an immediate improvement over my previous arrangement. "I hardly notice your antennas this time!" she exclaimed, "Why couldn't you have set it up that way back at the old house?". Why not, indeed. Well, after considerable thought, I decided against giving into temptation and leaving the hobby for good to pursue a beer can collection. I would indeed grace the skyline of my neighborhood with aluminum, and the W-51 would be my packhorse.

Which bands to operate? What types of arrays to put up? How much coax to use? How to position the tower away from the dining- room window? Why do I have to have a building permit? These are all questions I pondered as the preparations moved forward. The last was the ticklish one: The township in which I live does permit towers, as long as they are set back 1-1/2 times their height from the property line. There might be room for a PRB-1 case here, but my property lines were sufficiently far removed to allow the W-51 with a fair amount of yagis atop it, so no real ruckus was raised.

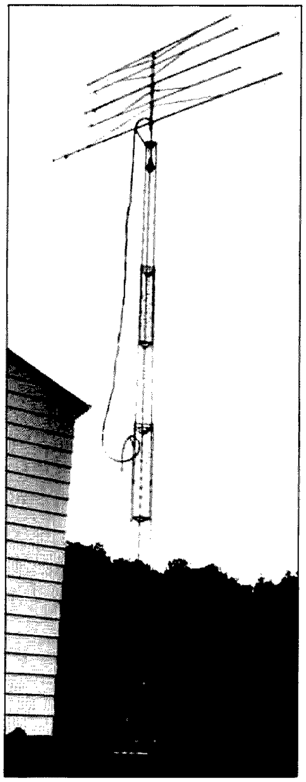


Photo A. The W-51 tower loaded up and extended to 80% of full height

"A new house looks more like a clean slate from which all of your previous mistakes...and hare-brained guying jobs have been erased."

I contracted with Mike Crawford WA2VUN of Tri-Delta in Fairfield, NJ, to provide me with (1) The W-51 (2) a suitable rebar anchorage (3) a custom easy-leveling baseplate and (4) 16 feet of 1/4"-wall 2"-hollowbar mast material. The next step was to dig a hole, which sounds easy, but is best left to someone who doesn't mind shoveling dirt vertically while standing in a space smaller than a phone booth. I began the excavation by preparing a hole 3 feet deep by 30" square, lost ten pounds sweating, reconsidered the project over a beer, and called a local contractor to finish the remaining 2 feet and pour the base.

Caveat Emptor

Remember the old Latin saying, "Caveat Emptor!" (Let the buyer beware!) Cement contractors must have this on their coat of arms. After many calls and much haggling, the contractor came out and excavated another foot of dirt with the intention of pouring a 12-inch lip around the base to make up the difference. Uh-uh! said the Building Inspector. That hole was going to be 5 feet, 6 inches or else! After a few more calls and a spirited discussion of how deep a five-foot hole really was, the contractor came back and finished the job.

In short order, the concrete was poured around the custom rebar anchorage Mike had welded together, and I was ready to erect the tower—which showed up almost a month later. A good omen: Almost every tower shipped to Mike in the past had been damaged by improper handling with a forklift, usually resulting in the "W" braces snapping loose. Well, this time we got lucky as my W-51 came through with nary a scratch. Mike showed up good and early one morning with the tower, plate, and numerous bolts to anchor it. It was a fairly simple matter for the two of us to slide the tower off his truck into place, and pivot it upright. After some leveling, the tower was ready.

At this point, I discovered that I hadn't cut the grass where I had placed my disassembled yagis in over 8 weeks. In the process, I'd completely lost track of my 55-element 1296 yagi, my 2-meter Boomer, 7-element 6-meter beam, and a handful of 21-element yagis for 70 cm and their boom braces. A tedious hour of mowing followed (during which I nearly chopped up a 44-element KLM yagi for 23 cm) and most of the yagis were rescued from the clutches of rye grass and weeds. Several spiders and at least one mouse had taken up residence in these sturdy structures, resulting in a general fumigation session.

Like an adventurer returned from Africa, I laid my treasures on the newly-mown grass, and set about cutting new coaxial feedlines. In the past, any cable at hand had been pressed into service. Thanks to QEP's gigantic going-out-of-business sale (which may still be in progress—they had that much cable left) I picked up 750 feet of brand-new Belden 9913, 400 feet of 8214, and 100 feet of Carol 8 conductor 16-gauge rotor wire. QEP's also supplied me with innumerable N connectors fitted for these cables as well

as a large supply of PL-259 plug assemblies.

A few hours with a calculator, the W-51 manual, and a tape measure probably saved me a lot of grief later. Careful calculations resulted in the correct length to get each feedline down from its particular yagi through a rotor loop and two coax arms to the special weatherproof window-entry box I'd constructed earlier. The W-51 manual provided a lot of useful information regarding the slack between the arms, distance between sections both collapsed and extended, and positioning of the rotor cable for the Ham-IV rotor to be installed. One mixup occurred with the mast; it was cut 2 feet too short at 14 feet, precluding use of the 6-meter yagi. In retrospect, this wasn't so bad since that same yagi needed extensive repairs from the June VHF Contest and couldn't be installed.

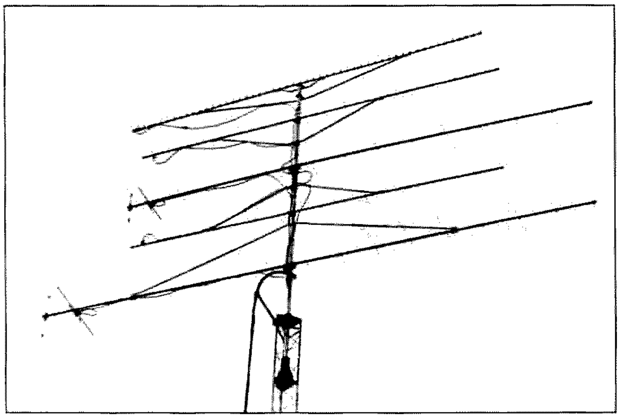


Photo B. Close-up of the 2m–23cm arrays on the W-51 tower.

The Lineup

The antenna lineup wound up as follows: A 55-element Tonna yagi for 1296 work at the top of the mast, raising it 65 feet above the ground with the tower fully extended. Two feet below that, I placed the top 21-element yagi of a stacked Tonna 70 cm combination. Two-and-one-half feet lower found the 220 Cushcraft Boomer and the bracket for the 70-cm power divider. Another 2-1/2 feet lower was the bottom half of the 70 cm array, and the 144-MHz Boomer was secured about 3 feet down from here. With over 2 feet of the mast inside the tower, that gave me virtually no room for the 7 LD, so it will have to be consigned to the roof tower.

Raising the mast was quite a chore, even with a gin pole. I had elected to employ a 2" thrust collar as extra insurance (with strong memories of the last hurricane that passed through the Northeast) and the fit was snug, to say the least. Also, owners of W-51 towers can attest to how painful it is to stand on the edge of those "W" braces for any period of time, even with heavy boots on. Add the hot sun and a horde of inquisitive (and annoying) yellow jackets, and you've got a project that's less than fun.

Once everything was in place, I allowed for a 4-foot rotor loop and adjusted the top coax arm to take all of the strain. The bottom arm is offset by about 45 degrees and supports all but about 10 feet of cable which forms the drip loop from the tower to the second-floor window entry. This latter system accomplished my first major goal: Get the feedlines off the ground and out of harm's way! When fully cranked, there's sufficient flex in the 9913 cable to allow for a full 360-degree rotation without any kinking, but the drip loop is maintained, accomplishing my second major goal: Keeping any water and ice out of the N connectors.

Despite the time and care invested in cable assembly work, I still had my doubts, so out came the IC-375, IC-475 and IC-1271 for a quick test. Connecting the 220 coax brought an immediate S9+40 dB signal from WB2NPE in Tabernacle, New Jersey. All was well there, and we exchanged brief reports. The Bird 43 showed about a 1.3:1 swr here. A quick call to WB2WIK over 50 miles away on 220.120 resulted in skeds for 432 and 1296, the latter with only 8 Watts up the feedline. Results? Better than 1.2:1 on both bands, and S9 +40 dB reports from Steve on 432 with S9 +10 dB on 1296. It was a success!

Photo A shows a view of the entire tower in a semi-extended position, while Photo B shows a closeup of the VHF/UHF array. The conclusions I drew from this project were many, but here are the key points: First, use the best coaxial cable you can. Keep those old runs in the junkbox, and buy new cable for such a job. Second, pre-plan carefully to avoid surprises while on the tower. Measure cable lengths carefully, and measure again. Allow sufficient length for rotor loops and support arms as well as drip loops. Third, assemble your feedlines with care and ring them out on the ground. A good rule of thumb that I follow is to check all of the cables on the highest band you'll use to measure losses. Make sure your connections are of the highest integrity and waterproof them.

Finally, take your time. Admittedly, I carried things a bit overboard in that department for 4 months, but once the wheels got rolling I proceeded at a leisurely pace (no doubt missing all kinds of intense E-skip and tropo in the process) to insure that once it went up, it stayed up. Let's face it: Climbing towers really isn't that much fun. It's a chore and the whole point of this exercise is to keep me on the air, not up in it. Plan and execute your work as if you'll never get a chance again to get back up that tower. (Did I just hear a mast-mounted GaAsFET explode?)

Random Notes

Larry Price N7BNJ has purchased the inventory of 8877 amplifier kits from Gene Shea KB7Q of "Q" Products. Effective immediately, the new address for "Q" Products is: 10412 36th Street East, Puyallup WA 98372. I also see from the 2- meter EME Newsletter that Mike Stahl K6MYC (one of the founders of KLM) is selling 5-wavelength yagis for 2-meters and 13- wavelength 70-cm yagis. He can be reached at M2 Enterprises, 1600 Decker Avenue, San Martin CA 95046.

Tropo Dept.

The past summer E skip season was sensational, so why should we expect any less from the fall tropo season? At the end of August, the weekly nets of the Mt. Airy VHF Society (PackRats) were in full swing, beginning on 50 Mhz at 7:30 local EST and continuing right on up to 23 cm at 9:30 PM. This would be an excellent opportunity to check out the new tower and antenna system, so I cranked it up and ran through all 5 nets.

The surprise of the evening came when Bernie Bonnar VE1UT of Yarmouth, Nova Scotia checked into the two meter net with an S9 +40 dB signal. Normally this isn't unusual for him, but the strength of his signal definitely was. The 220 Mhz net started at 8:30 PM and sure enough, there was Bernie pushing the S meter over 9 on peaks while running 8 Watts to a Boomer. Contacts were quickly exchanged with the net stations, and we proceeded to 70 cm at 9:00.

This time Bernie was hitting peaks almost as strong as those on 2 meters! At least 6 operators in the area had armchair copy with him over a path which exceeded 450 miles. Both myself, Roger Amidon K2SMN and Steve Katz WB2WIK encouraged Bernie to drag out his LT 23S transverter and fire up with 8 Watts just for the heck of it. We operated full duplex from 70 cm to 23 cm to help in peaking the antenna headings, and contact was established with K2SMN first (no wonder, considering he runs 200 Watts to 4 X 45 element loop yagis at 175 feet!).

I gave it a shot with just 8 Watts to 55 elements, thinking I heard Bernie's carrier, but it wasn't enough. I knew I should have connected the 3CX100 amplifier in the line! Finally, Steve WB2WIK managed to make a two-way running 80 Watts to his 55 element yagi, copying Bernie about an S5. All of us read VE1UT quite well on 70 cm for the better part of two hours, with Steve reporting signal peaks close to 50 dB over S9 at times (Bernie was running about 100 Watts on 70 cm to a single RIW 19 element yagi).

Not bad for the beginning of September. Will we see a repeat of the fantastic Thanksgiving and Christmas tropo of 1986? Based on what I've heard so far this year, I wouldn't bet against it. Better keep your receivers on 144.200, 220.110 and 432.110 this fall!

Next month: A compilation of VHF/UHF newsletters and clubs. Also, reviews of the IC-12AT handheld, and a report on the September VHF Contest. Until then, see you Above and Beyond!

LETTERS

Continued from page 45

ESAELP THGIR

Being a radio and car buff like yourself, I've always appreciated the fine anti-55 articles you've written in *73 Magazine*. Since you've asked to hear from other hams who may have experience with radar, I'll comment.

Our ignorant leders believe slower traffic results in fewer accidens per mile. To help achieve this unworthy goal, most police agencies carefully avoid enforcement of lane-discipline. As long as self-appointed rolling-roadblocks move over for the police, they are safe from the law.

I might suggest, Wayne, that your next article on driving address the very real problem created by the typically lazy/belligerent American driver: lack of lane discipline. It is, as you may realize, a national disgrace. Foreign visitors are appalled at the current situation.

It is an embarrassing predicament that apparently must be solved by the private sector. The group called Citizen's Coalition for Rational Traffic Laws is currently mounting such a worthy campaign, and it needs all the help it can get.

Art Kobres K4FWJ
Lutz FL

Thanks for your letter—love your front car sign! Reminding the 73 readers about road courtesy probably won't help significantly, but we'll give it a try.

—Wayne

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
2310 Romayor Court
Pearland TX 77581

November promises to be a great month for satellite enthusiasts. Early in the month, The Radio Amateur Satellite Corporation (AMSAT) holds its General Meeting and Fifth Annual Space Symposium. AMSAT-Oscar-10 should return to service. While Fuji-Oscar-12 continues with a mix of mode JA, JD and recharge, the RS-10/11 combo brings us more mode A, K and T. There's something for everyone in November.

AMSAT Meeting

As reported last month, the yearly AMSAT meeting will be held in Southfield, Michigan, near Detroit, in conjunction with the AMSAT Space Symposium. Mark November 6th through the 8th on your calendar and plan to attend the most ambitious AMSAT gathering to date. If you are not yet an AMSAT member, but would like to attend, call AMSAT at 301/589-6062 and request registration materials.

The primary program track is loaded with topics to interest hamsat chasers. There will be reports on the satellites now in orbit, including A-O-10, F-O-12, RS-10/11 and UOSATS 9 and 10. Details and progress reports on Phase 3C, A-O-10's replacement; and Phase 4, the geosynchronous hamsat for the 1990s, will be presented. Other talks will cover new technology, such as digital signal processing, amplitude companded sideband and advanced software for satellite applications. You can also hear discussions about future manned space flight, or ham-in-space activities.

For those of you with a more general interest in satellite activities, there will be an alternate track of presentations staged concurrently with the primary hamsat talks. Some of the topics in this group include: classroom applications of satellites, visual observations, orbit prediction, listening to manned missions, weather satellites, the EDSAT and NUSAT programs, and home equipment considerations.

OSCAR 10

On August 11th the A-O-10 ground-control stations decided to remove the satellite from service for up to 90 days. Early in the month, the beacon (a usually constant carrier on 145.807 MHz) began frequency shifting (FMing). After that, the transponder shut off several times. Ground-control felt this indicated low battery charge.

Originally, it was hoped that A-O-10 operation could be allowed through the end of August. Three factors caused A-O-10's early removal from active service.

The satellite's solar panel orientation with respect to the sun constantly changes. When the panels are perpendicular to the solar radiation, the spacecraft receives maximum power. As the angle changes, available power is reduced. Based on past experience, the satellite controllers believed operation could continue through the end of August without problems. However, we do not know the precise orientation of the satellite. It has been a long time since A-O-10 was capable of relaying its telemetry and thus its orientation.

A second reason for the early loss of satellite activity could be due to the charging circuit on board the spacecraft. Normally the Internal Housekeeping Unit (IHU) determines the operating conditions for the battery-charging circuit. With completely random values in the radiation-damaged memory, the information being sent to the charging circuit could be anything from no charge to full charge. If the battery voltage falls below 10.5 volts, an independent watchdog circuit overrides the computer-controlled switching regulator and connects the 36-volt solar array directly to the 14-volt battery. While this may seem like a good high-power solution, it is not. When the solar array is pulled to such a low voltage, efficiency is lost. The current available to charge the battery does not increase as the voltage decreases and the power transfer is much less efficient.

Since nothing can be done about the sun angle and battery charging circuitry, satellite user operating procedure will have enormous effect on the life of A–10. Heavy use by high-power stations can cause irreparable damage to the battery. Operation of any kind during eclipse can have the same impact. When A-O-10 is released for operation in November, keep your transmit level limited to 100 Watts effective radiated power (ERP). That's 10 Watts to a 10-dB beam antenna. Also, do not operate outside the allowed time periods and monitor the AMSAT nets for updates.

Photo A. Fuji OSCAR 12 mobile operation from N6DGK.

FUJI-OSCAR-12

When A-O-10 activity came to a dramatic halt in August, schedules for satellite operation from the JARL ignited interest in F-O-12. Even though the time allocated for the digital transponder is more than the analog, or JA mode, many stations previously upset by the lack of scheduled activity have returned to F-O-12. The schedules have projected operating times for about a month. This isn't enough for reporting here, but if you monitor the AMSAT nets, or are an AMSAT member, you can get information on the air or via the "Amateur Satellite Report", AMSAT's bi-weekly newsletter.

For those of you who have just begun or are considering satellite contacts via F-O-12 mode JA, some recent studies suggest a change in previous operating methods. In the past, all satellite stations have been requested to keep their receivers set on one frequency while varying the uplink, or transmitter frequency, to counter the effects of Doppler shift. This procedure does well for A-O-10 mode B using 435 MHz up and 145 MHz down. When the reverse configuration occurs with 145 MHz up and 435 MHz down, as with mode JA on F-O-12, moving the transmitter actually cre-

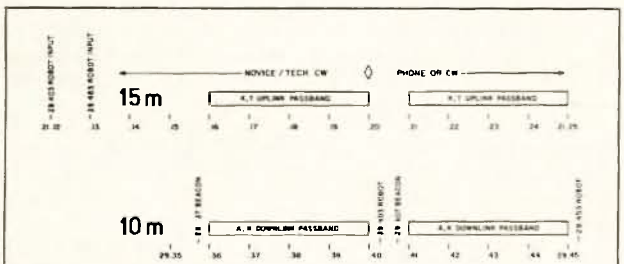


Fig. 1. Frequency chart for RS-10 and RS-11.

LOOKING WEST

Bill Pasternak WA6ITF
28197 Robin Ave.
Saugus CA 91350

All Is Not Well In Enhancement Land

I hate to tell you this, but there are some people out there in Hamland who cannot accept the fact that their day of holding back the progress of hamkind has come to an end. The "Day of the Advanced and Extra" is waning and they will be replaced by the Novice!

No, this writer is not living in some far-off world of his own. Happily, this "west-coast world of nuts and kooks" where I reside appears to be causing the least problem to the newly enhanced Novice operators. I hate to point fingers, but this seems to be an east-coast and mid-west problem. It's also a problem that most hams refuse to acknowledge, to face, or to remedy. But, don't take my word for it. Let me quote a well-respected journalist and truly dedicated ham.

***220 Notes* Tells All**

Art Reis K9XI is the editor of *220-Notes*—the 1 1/4 meter special interest newsletter. He is also among the most honorable people I am fortunate to consider as a friend. In his June 1987 issue, Art noted the following:

"This is one of those times when I feel like I'm preaching to those already saved. The subject is the treatment of Novices by upperclassmen of this hobby and, to tell the truth, what I am hearing from out in the hinterlands is a super mixed bag.

"In my particular bailiwick, Chicago, acceptance of Novices on the 220 band appears to be rather universal. On the other hand, I'm hearing all sorts of horror stories from a few other metropolitan areas and from a number of rural areas, about how Novices are being shut out or mistreated when they try to make their way onto the band to do their thing.

"The harassment, assuming it exists, is allegedly taking two forms. In the first scenario, local 220 repeater groups or owners are telling local Novices to keep off, or are closing their machines to them until they become 'real hams'.

"The second scenario is found in those areas where 220 machines are fewer in number, and where there may be none within HT range. In the stories that I am hearing, local ham clubs are refusing to get involved with 220 at all because their members don't want to mingle with Novices on repeaters! This is one scenario I have heard from my friends in the Illinois Repeater Association, so I know that it happens."

On Ten Meters

If only this was the only report of hate toward the enhanced Novice operators by the holders of higher class licenses. But it appears to not be limited to either the 220-MHz band nor is it limited to Illinois. It's also happening on 10 meters. I've heard about this problem firsthand over the landline. Usually, it goes something like this:

The hate mongers among us, fearful that their private domain is being threatened by the newcomers, sit in ambush. They wait for some unsuspecting Novice to come on the air for the first or second time. Sometimes they answer his CQ, and in other cases, they let him be the one to answer their general call. Either way, they get the unsuspecting shnook into what at first seems to be a friendly one-on-one contact. Soon, four or five other stations join in, and in short order the "friendly QSO" degrades into a name-calling contest with the higher class licensees doing the name calling! Many times the insults are ethnic or racial in nature; rarely is a real cussword used. These cowards may be hate mongers, but they are far from stupid. They well know that these days, to be caught saying even one of the banned "10 dirty words" on the air will lead to a quick license revocation, or worse. More often than not, these tirades, which sit on the legal edge, sometimes go on well after the Novice has left the frequency. Let's give this practice a name . . . Novice Baiting.

Who Are These Creeps?

Who are these Novice Baiters? They appear mainly to be higher-class licensees living along the eastern-seaboard and into the south and south-central states. Notice I said *higher class* licensees as opposed to *long-term* licensees. Judging from their voices, most sound like middle-aged people as opposed to the elder statesmen of our service.

I'll bet that some of you have heard these wolf packs in action, also . But, to "protect the image of Amateur Radio," you turn the other cheek! After all, since you are being nice to Novices, it's "really not your problem." Or is it?

It's Your Problem, Too

Let me turn again to the writings of Art Reis K9XI to show you why you must care; why you must get involved with running the "Novice Baiters" off the air so that the new Novices can have a chance to mature into viable amateurs and thereby enhance our service. What is happening here is a violation of the spirit of this hobby—no question about it. But it goes deeper than that.

"Soon, four or five other stations join in, and in short order the 'friendly QSO' degrades into a name-calling contest with the higher-class licensees doing the name-calling!"

Amateur radio is a microcosm of society. The Novice licensees are the children (chronological age has nothing to do with it) in our society. The children of any society are the future of that society. Novices represent the future of amateur radio. We must realize that those moves to harass the Novice out of the privileges which are now the law or any move to mistreat a Novice who shows up for the first time on the local 220 repeater, local 220 simplex net, or the 10-meter Novice Phone band amounts to *de facto* abuse of the future of our hobby. Any decision by your local club to abandon a recently proposed 220 repeater project because "those creatures would show up on it," is reprehensible, and I for one will fight tooth and nail against it.

The leadership of clubs who practice "Novice Obstructionism" (i.e., those who believe that "Novice" is spelled "No-voice") are in for political trouble. Remember that Novices who have the fortitude to stick it out do grow up to be Technicians, Generals, Advanced and even Extra-class licensees. And, these Novices will be different from the Novices who were low-band CW only. They will be more cosmopolitan in nature. Their interests and outlook on the hobby and on *you* as a leader in *their* ham community will be different, because their experiences within the hobby will be much more diversified than anything Novices have experienced in over 20 years.

They will become a voting block to be reckoned with—soon. They will remember who helped them and who didn't. Anyone who has seen the film *Revenge of the Nerds* knows what I mean.

Art finishes his editorial comment by asking why anyone would want to mortgage their own future as a leader of the Amateur community with such an unaccepting attitude to Novices. He gives no answer. If you want to read more of the writing of this rather prolific radio amateur, I suggest you subscribe to his *220-Notes* newsletter. The cost is $5 a year. The address is *220 NOTES*—Subscription Department, c/o Walt Altus WD9GCR, V6539 Birch St. Onalaska WI 54650. Even if you don't operate 220, it's worth it to read what K9XI has to say about ham radio—it's good sense and good reading.

The Meek Will Inherit Ham Radio

As I said, Art offers no answer to his final question. He came close, but didn't quite hit the mark. Maybe I have—fear. There is fear that, if Novice Enhancement is successful—and there is every reason right now to believe it will be—that the personal or collective power base of younger higher-class licensees may be undermined by the new, and highly politically motivated, Enhanced

Novice. Their egos cannot accept the inevitable; that the success of Novice Enhancement could, by the sheer number of those who obtain licenses, make the United States Novice Class licensee the most politically powerful group in ham radio that this nation has ever seen. So, instead of showing the new Novice due respect, the fear makes him hate. This hate manifests itself in the ways that both Art Reis and I have now detailed.

> ***"Novices represent the future of amateur radio."***

Consider this: about a decade and a half ago, it was said by experts in communications politics that if it were possible to organize all of the CBers then on the air, it would make for a rather formidable political block. It's true that many tried. Some, like HF International, were pretty successful. If CB hadn't lost favor with the public, we might all today be signing "HF Numbers" rather than ham callsigns.

I submit that we had better treat the new Novices with due respect, save someone outside of ham radio comes along and succeeds this time where they failed in the era of CB. The ARRL recognized this. At their July Board of Directors Meeting in Atlanta, they voted to open up a limited number of positions in the field structure to Novice class operators. But, will this be enough? Or will another smart con-man like CB's Rick Cooper and his Communications Attorney Service of the late 1970s come along and build a new amateur radio superpower structure with hundreds of thousands or millions of Novices as its power base? Don't say it can't happen. It's happened in radio many times before, and this story is far from over. And, oh yes. A scary but Happy Hallowe'en from those of us who write the late shift from Los Angeles.

HAMSATS

Continued from page 69

ates much more Doppler-induced QRM than anticipated.

Dave WB6LLO reported this mode JA effect to most active F-O-12 operators, but it is difficult to break old habits dating back to early AMSAT-OSCAR-7 days. Perhaps these effects were noticed on AMSAT-OSCAR-8 mode J years ago, but the potential for QRM was low since there were fewer users.

Until further notice, move your receiver while on F-O-12 and move your transmitter while operating A-O-10 to keep the possibility of collisions between QSOs to a minimum. Some adjustments to the receiver are always necessary to keep the other guy in tune, but with practice and patience these operating practices will become second nature.

Procedures for other modes like A, K, and T will not be as much a problem since the frequencies are much lower and Doppler shift and its potential to slide your contact into someone else's is much less. In the future, microwave bands will be employed for some transponders. The possible Doppler shifts may be in the tens of kHz, but, until then, contending with F-O-12 and its needs will be enough.

Mode JD users are reminded that the JD transponder still cycles on and off every two hours. The change-over time occurs when the satellite is within range of Tokyo. Do not expect to see a mode change from JD to JA, or JA to JD, while the satellite is over the U.S.

Last month I mentioned the possibility of mobile contacts via F-O-12. Photo A shows Tom's (N6DGK) system on the road.

While simple whips resulted in many fine RS-10/11 contacts, Tom has experimented with different configurations for chasing F-O-12. Although the small 70-cm crossed yagi cannot be used while in motion, it has other advantages. It is mounted on a camera tripod for quick set-up and easy aiming. Should the desense from the two-meter transmitter become a problem, he can move the 70-cm receive antenna away from the car and continue operation. The small crossed yagi has a broad beamwidth, requiring few adjustments during a satellite pass. Tom

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ATV

Ham Television

Mike Stone WB0QCD
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CONTEST RESULTS!

The unofficial results have been tabulated for the 6th annual August 1987 North American USATVS Fast Scan TV DX and QSO Party UHF Contest which was held during the week of August 17th to the 23rd. Scores are being checked for accuracy with the final results to be published in the September/October issue of the Spec-Com Journal.

There were a total of three operating contest logging categories that you could enter in from one of three declared locations: Single-op, Multi-op, and Club-op at fixed, remote, or mobile operations. A base score of 100 points was awarded for per-station contacts with at least a P1 locked-up TV video signal. Bonus points were awarded for the reception and transmission of color and audio (4.5 subcarrier, on-carrier, or independent). A DX multiplier existed in ranges of 25-mile increments and a band used multiplier gave extra points to those who used other than the 70-cm band. Special pre-made USATVS Contest forms were available for those who requested them prior to the event. Over fifty were mailed to key ATVers and Section Managers in the USA for local distribution. Rules and guidelines of this contest were published in the June issue of Spec-Com and here in the *73 Magazine* column.

ATV's only contest each year is sponsored by the USATVS. The rules and guidelines for this contest have varied through the years as contest organizers fine-tune this unique special contest to do what they want to accomplish. The main purpose of this contest was to bring out activity during contest week, and organizers agree that this certainly happened. The second purpose of this contest is to recognize those FSTV station operators here in North America who have excelled in building up a long distance, quality home television operating studio on difficult-to-master UHF and above frequencies. This is no easy task: It is far more challenging than mere SSB, FM, or satellite modes operation on the same frequency.

New to this year's event was the allowance of the use of ATV repeaters, with a 50% point penalty. As it turned out, very few contacts were made through repeating devices across the country, but it was generally thought a good idea not to restrict entirely the use of them if contacts were needed to be made through them usually by low power or low-level terrain stations. This procedure will become part of a regular feature in future contests.

The Winners

First place in the Multi-op category and with the most accumulated points in the nation and North America was the team of W6VCF and K6DFM operating from Malibu, California. Together, they scored a whopping, record-setting 30,951 points! They operated form a motor-home high atop Saddle Peak and made 32 contacts—all done on the last day of the contest. The ranges of many of their contacts direct on simplex were 45–125 miles. Frequencies used were 434, 923, and 1240 MHz. On 434 MHz, they ran 6 Watts into a 48-element J-beam. On 910 and 1243 MHz, they ran 1.5 Watts into a 27-element F9FT. They also used portable power from a Honda EM-600 generator. Only 3 out of the 32 contacts were on an ATV repeater, WA6SVT/R, which is located at Santiago Peak in Orange County at a distance of 70 miles from their station. Both winners have 3-year subscriptions to Spec-Com and framable contest award recognition certificates. The W6VCF team are repeat winners from a past contest and participate each year in the event. Congratulations, fellahs!

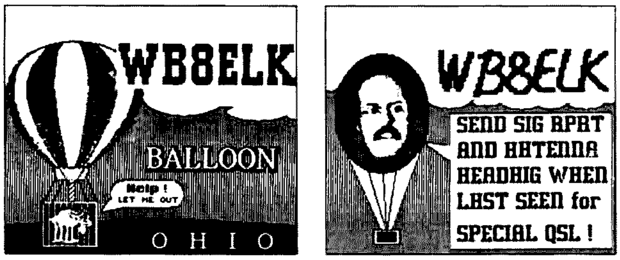
In the Single-op category, yours truly took first place with a score of 20,915 accumulated points. I had 29 contacts—again, only three via the ATV repeater, and all on 70 cm. My longest contact was 180 miles. Unfortunately, for us here in the Midwest, there were no band enhancements or openings during contest week. Taking second place was Jim Ryan K9MTE of Woodstock, Illinois. Jim had 16,350 points with 17 contacts. He has been on FSTV for only a few months now, and has really become the most reliable HAM-TV station to work and "see out" the Chicago area. Henry Ruh KB9FO has been running early morning video and talk schedules for some time now and was P2 here in Iowa during the contest. Last year's winner, N9AB, of Ivanhoe, Illinois, was heard only one or two nights. He gave out some pointers, but chose not to work the contest this year.

Competition is getting fierce for once in the Windy City. The Chicago 2-meter accessible Color Weather Radar at 426.25 MHz has been on-the-air now for 6 months and is working just fine. It has been seen as far away as Hebron, Indiana, at times of enhancement at P3–P4 levels. Work continues on the Chicago ATV repeater project, but it has been hampered by its inaccessibility because of the NBC strike at WMAQ-TV.

Third place went to Bill WB8ELK as Single-op ATV mobile! Bill (of Findlay, Ohio), amassed 12,750 points. He completed the delayed launch of the helium-filled balloon (reported below) and then packed up all of his FSTV and 2-m gear and went to Maine for his vacation. During contest week, he travelled and made TV contacts along the way, some even on freeways. On a few, he drove right up to their door! Some notable contacts in New England were W3ZQS, WA3VCR (how is that for a call?), W2OSW, WB2UBR, and KB2CXM. Way to work 'em Bill—the USA's only working ATV mobile for the contest! Were you horizontal with your quad?

Fourth place went to Donald Townsend KE7NR of Chandler, Arizona with 8,925 points. Don reported good activity and enthusiasm in his area and had 18 contacts. Fifth place went to Marty Fitzgerald WD0BCE of Davenport, Iowa, with 8,400 points and 13 contacts. Other Top-Ten finishers include Henry Ruh KB9FO of Des Plaines, Illinois, with 8,175 points; Casimere Pustelnik W2OSW of Buffalo with 6,525 points; Ron Hines WA9NJR of St. Paul, Minnesota, with 5,900 points; John Hegeman WB0BIZ of Bettendorf, Iowa, with 5,800 points; and Don Fuller W2WHK of Tonawanda, New York, with 4,250 points.

There were 23 entries this year. Contest award recognition certificates will be mailed to all stations who entered the contest. Congratulations to all!



Figs. 1 and 2. Computer screens transmitted by balloon package.

ATV Balloon Launch

The WB8ELK helium balloon experiment was launched on August 15th, at 1:25 p.m. EDT from Findlay, Ohio. The balloon package consisted of a 1-Watt ATV transmitter (PC Electronics KPA-5), a custom-built computer graphics generator in color with two graphic screens timed in sequence, a GLB CW ID module, and a 100-mW 2-m FM transmitter made by International Radio Kits in the early 70s. Power consisted of 10 Polaroid Lithium cells connected to provide 500 mA at 12 volts for approximately 7 hours.

The balloon was a 5-foot weather balloon made by Kaysam and is the same balloon used by the National Weather Service for Radiosonde launches. The balloon system consisted of the balloon, a parachute for recovery, aluminum foil for observation, and radar reflection, and the transmitting package on the end. The two-meter antenna was a 1/4-wave vertical whip, and the 439.25-MHz ATV antenna was an omnidirectional turnstile mounted on the bottom of the package.

The total package weighed in at 2 lbs., 11 oz., and our final lift from the balloon was 2 lbs., 15 oz. This gave only 4 oz. of lifting force resulting in a slower-than-planned ascent of 700–800 feet/minute.

During the launch, the ATV antenna became damaged so that two of the elements on the turnstile were bent downward resulting in deep fades as the package spun around. At 2:59 p.m., at

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about 60,000 feel, the ATV transmitter quit, and the 2-m beacon quit fairly suddenly around six minutes later, at around 70,000 feet. One possible cause of all of this is bursting batteries at the near-vacuum of that altitude. The balloon was followed by Jim WA8VWY in his Cessna shortly after launch, and was able to optically track it until 4:00 p.m., where it was estimated to be at an altitude of 100,000 feet. The ground crew was able to view the balloon with binoculars until 4:30 p.m. with the balloon appearing as a bright star. After that, the balloon moved close to the sun and was lost from view of the ground crew as it slowly drifted westward. Due to very light winds, the balloon stayed within 18 miles for over three hours; but it was never seen again after 4:30 p.m. It's hoped that someone will find it during the fall crop harvest.

The 439.25-MHz ATV signal was received as far away as Buffalo by W2RPO (290 miles), and in Chicago (250 miles) at a P2–P3 level by K9MTE, KB9FO, and others. Stations within 100 miles reported varying signal strengths of between P3–P5 with deep fading, although W8RVH tilted his ATV antenna 45 degrees which eliminated most of the fading. Picture reception reports have been coming in from Ohio, Michigan, Indiana, Pennsylvania, Illinois, New York, and Ontario.

The 2-m beacon was heard as far away as Baltimore (400 miles) by N3AGG, and in St. Louis (400 miles). The 2-m range seemed to follow the radio line-of-sight formula $1.4 \times \sqrt{H}$ while the ATV range seemed to approximate the optical line of sight formula $1.2 \times \sqrt{H}$. H is height in feet.

An interesting phenomena occurred within three minutes of launch at about 2,500 feet, when the balloon passed through an inversion layer and produced reception in Cleveland, Pittsburg, Detroit, and Canada, of a strong 2-m beacon and ATV picture for about 1 minute. Band conditions were interesting indeed as WA8SAJ in Cleveland (125 miles) reported hearing both signals as the package was activated several minutes prior to launch at an altitude of three feet off the ground. WB9FOL received the beacon 8 seconds after launch at a distance of 110 miles.

Bill WB8ELK thanks all who assisted him with this project, and in particular WA8HDX for the use of his barn, WA8VYW for his excellent airplane tracking, WB8MSJ for working out the balloon-filling procedure, KA8LWR and WA3USG for their fine job in coordinating the 40-m information net, W8VKR for his equipment donations, Spec-Com and WBØ QCD for donating the ATV antenna and solar cells for balloon II, W6ORG of PC Electronics for his technical support, and finally the valiant efforts of the chase team of N8DOO, WA8GAU, W8RSK, NR8Q, and KA8WLV. Any group capable of looking through binoculars at a tiny speck in the sky for hours while lying in a ditch filled with poison ivy has to be dedicated! ■

Hamsats

Continued from page 71

runs 80 Watts on Fuji's two-meter uplink and has two GaAsFET preamps available for the 70-cm downlink.

RS-10/11

More details on the antenna configuration of our newest hamsats are now available. As reported in the September column, RS-10 and RS-11 are part of a larger Soviet spacecraft, COSMOS 1861. Four antennas on the structure are used for the amateur radio satellites. RS-10 and RS-11 each have their own two-meter, half-wave verticals, but the other two antennas, a ten-meter ground plane, and a 15-meter ground plane, are shared between the two units.

I have received requests for a new RS-10/11 frequency chart. The April column presented a preliminary offering for RS-9 and RS-10. This chart from Ron WA5RON has been updated and is shown in Figure 1. The graphic presentation is much easier to use than a table of frequencies.

For most satellite enthusiasts, desense has been a major problem for serious mode K operation, which uses 15 meters up and 10 meters down. Two interim solutions can get you on the air until the problem can be completely cured.

The first is to choose a downlink frequency several kHz away from other stations. Using the chart in Figure 1, or the table shown in the September column, calculate an uplink frequency to match with the downlink receive frequency you are monitoring. Call CQ even though you cannot hear yourself through the satellite due to the desense problem. Since calling in the blind might put you on top of another QSO, it would help if a friend could monitor the downlink to see if your calculations are correct.

The second method is to have a friend not only monitor your downlink, but also to relay it back to you. This can be done either by phone, via two-meter FM, or, for the Novices, 220 MHz FM. Two hams in Houston, W5BKK and KE5IC, have tried this quite successfully with mode K Robot operation.

AMSAT-NA Technical Journal

A new publication is now available from the Radio Amateur Satellite Corporation. The Amsat-NA Technical Journal, or just "ATJ", was created to publish papers reporting findings in the field of low-cost satellite design, construction, and operation.

The first issue, available from AMSAT-NA for a donation of $10, plus $2 postage and handling, is 45 pages long, printed on quality paper, and contains no advertisements. Some of the papers are quite technical, but as Editor Bob Diersing points out, in order to achieve personal advancement in a technical field, it is necessary to study material that may be far beyond your level of experience at the time. Figures, tables, schematics and other illustrations are prominent in "ATJ". Give this one serious consideration for inclusion in your hamsat library. ■

Dx

Hams Around the World

Chod Harris VP2ML
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Santa Rosa CA 95402

The XF4DX Revillagigedo DXpedition

Has the one-man DXpedition gone the way of the spark gap and coherer? The traditional DXpeditioner was a single operator hopping from place to exotic place, working the multitudes, and moving on. Danny Weil, Gus Browning, Don Miller, and others refined the art of DXpeditioning, now followed by a small minority of DXers. Eric Sjoland SM0AGD and San Hutson K5YY, and, of course, Lloyd and Iris Colvin W6KG and W6QL follow these hallowed footsteps around the world.

But recent years have seen the advent of the luxury DXpedition. The recent Clipperton trips demonstrated that enough DXers with sufficient funds can activate some of the rarest islands in the world in relative comfort and safety. Rather than sailing their own boat, or relying on local, unscheduled means of transportation, the Clipperton crew and others have chartered a large, comfortable yacht and avoided the problems that plagued earlier Clipperton DXpeditioners.

The February XF4DX DXpedition to Revillagigedo was another example of a high-tech (and expensive) approach to operating from rare locations. Five amateurs from the US and Mexico chartered a Grumman G-1 twin-engine propjet (for almost $17,000) to spend a few days operating from this Pacific island.

The DXpedition Begins

The group assembled in Midland Texas, where Tiger Charter helped the amateurs load more than 3600 pounds of gear, food, and supplies into the plane. After a stop in Baja, Mexico, to pick up XE1IKP, the group winged the 450 miles west to Socorro Island, the largest of the Revillagigedo chain of volcanic islands. They anxiously circled the small landing strip, remembering the last Palmyra DXpedition that crashed on the broken runway on that remote spot. They were prepared to turn back and cancel the DXpedition if the field looked dangerous. Fortunately the field was clear, and soon the plane rolled to a stop on a paved parking ramp.

The DXpeditioners immediately began unloading their gear, and started to set up the operating positions and antennas. Two Cushcraft A-3 tribanders went up on push-up masts, with only one minor problem. In their hurry to leave, the amateurs lacked time to pre-assemble and test the antennas. When they opened the box, they discovered that the center insulator of the driven element was missing. In the spirit of DXpeditioners everywhere, they sawed off part of a broom handle, and put the antenna on the air.

For 160 meters they erected a Minooka Special (see May 1974 QST for details). The antenna performed splendidly, and helped provide many Top Band Dxers with an XF4 contact. An inverted L for 80/75 meters and an inverted vee for 40 and 15 meters completed the antenna farm. Unfortunately, every tree in the vicinity of the airport had long since been converted into firewood, and antenna supports taller than knee-high were sadly lacking. Still, the simple antenna assortment worked well, especially into Europe, where XF4 ranked 21st on The DX Bulletin's 1986 most-wanted-countries list before the XF4DX trip.

Photo A. With their destination a thousand miles from the nearest Radio Shack, XF4DX DXpeditioners K9AJ, K9VV, K4UEE and W0RLX (from left) review their equipment list one more time before packing. (WA8MAZ photo)

Rigs included Drake twins, ICOM and Kenwood transceivers, and a Drake TR7, followed by Alpha and other amplifiers. For electric power, the XF4DX DXpeditioners packed three Yanmar diesel generators, totalling almost 9 kW of available power. The generators ran well on jet fuel, siphoned from the tanks of the Grumman G-1. As soon as the first station was connected up, XF4DX was off and running.

Photo B. Nearly two tons of radio gear, antennas, food, and supplies await departure.

The operation proceeded smoothly for a time, until some of the mainland Mexican amateurs voiced doubts about the group's legal status to operate on the island. To avoid conflicts, the XF4DX group elected to shut the station down for a time, until matters could be resolved to everyone's satisfaction. Unfortunately, this shut-down coincided with a holiday in Mexico, adding an extra day to the delay in re-activating XF4DX.

After a tour of the island, including a hike to the summit of the 1130-meter high central moun-

tain, the group resolved the minor differences of opinion, and the XF4DX was on the air again.

See It On Video

Living conditions were primitive but adequate on the airport parking ramp. The group siphoned water from the airplane's tanks, as well as fuel for the generators. One evening, however, a strong Pacific storm sent rain sheeting into the tents. At one point, more than an inch of water sloshed back and forth in the bottom of the tent, where power leads hung carefully suspended above the high water mark.

Soon (all too soon, given the interruption in operating), the group had to dismantle the gear, pack the plane, and head back to the States. However, as the veteran pilots prepared the aircraft prior to takeoff, they noticed a split hydraulic line that would leak out all fluid, and thus cut off all controls, long before the plane could reach the mainland.

The pilots conferred, and decided to switch lines with the hydraulic tubing that controlled the landing gear. Since that line is only used at takeoff and landing, the small leak wouldn't drain the fluid supply. They hoped.

Fortunately the flight back to Cabo airport was without incident, and the plane landed safely in Baja, where replacement parts awaited their arrival. The DXpeditioners, after a week without showers and four days without a cool drink, raced for the bar, where they soon found themselves alone, despite the extremely crowded airport!

Their problems didn't end with their return home, as the authenticity of the trip was challenged, threatening DXCC credit for the contacts. Again, the misunderstanding was quickly resolved, and XF4DX was accepted for DXCC credit in early June.

The group's problems limited actual on-the-air time to only 93 hours, but the dedicated DXpeditioners made the most of their time, and logged 15,110 QSOs, or 166 per hour! CW contacts outnumbered SSB contacts 8700 to 6400, with many European and more than 2000 Japanese QSOs included.

Operators on the trip were K9AJ, K9VV, WØLRX, K4UEE, WA8MAZ, and XE1IKP. Others assisting included XE1ALD, XE1JAK, and many more. The operators even put together a VHS videotape of their experiences,

Photo C. At about $2 per QSO, the XF4DX trip may well deserve the dollar signs on their chartered Grumman G-1 propjet.

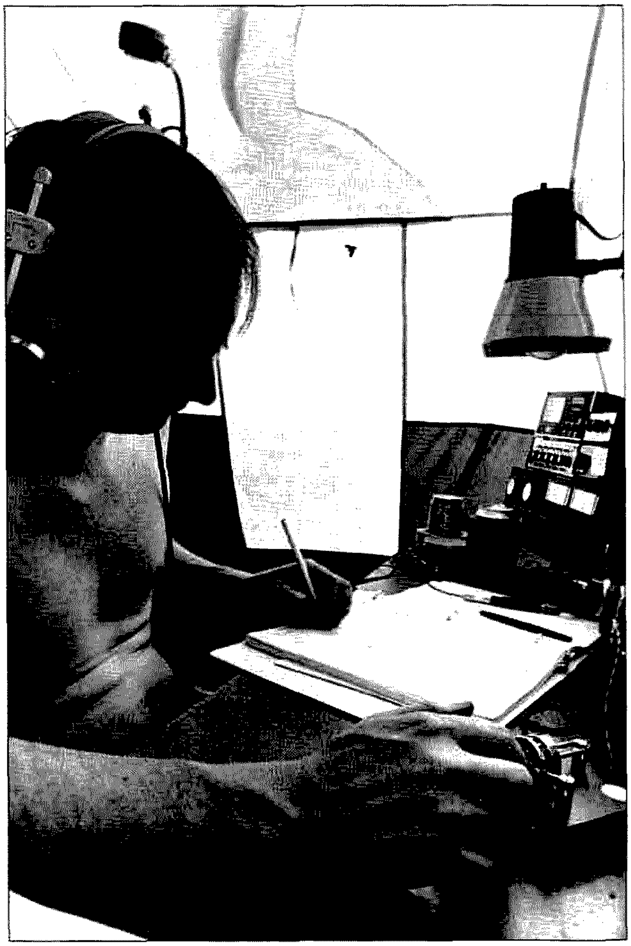

Photo D. K9VV hammers out 40 meter CW contacts as XF4DX, from Sorroco Island.

which is available for $20 postpaid from Don Daso WA8MAZ, Route 1 Box 246, Mt. Holly NC 28120.

Clipperton boasts a serviceable landing strip, as do many relatively rare DXCC islands. The XF4DX crew showed that a small group of dedicated DXers can activate a rare one with some time, planning, and plenty of money. A DXpedition to Baker/Howland Island KH1, for example, lacks only a handful of DXers who have a few weeks and several thousand dollars each to spare. ■

WELL, I CAN DREAM, CAN'T I ?

"ARE YOU THE HANDSOME ONE WHO ADVERTIZED FOR 'HAM HELP'?"

WELL, I CAN DREAM, CAN'T I ?

"WHILE WE'RE DIGGIN' YOU A DEEPER GROUND, WE STRUCK OIL!"

AERIAL VIEW

Antenna Update

Arliss Thompson W7XU
7314 SW 28th Ave.
Portland OR 97219

BROADBAND 80m ANTENNAS

Eighty meters is one of our most popular HF bands. It's also our widest in percentage terms. This latter point can cause difficulties if you enjoy operating at both ends of the band but are using a coax-fed single-wire dipole and a typical solid-state transceiver. The problem that arises is that the ordinary 80-meter dipole is too narrowbanded to present an swr of 2:1 or less over a bandwidth of 500 kHz. Therefore, your transceiver output begins of fold back as you stray very far (typically more than ±125 kHz) from the resonant frequency of the antenna.

One solution is to use a transmatch to couple the transceiver to the antenna system, but doing so compromises your ability to make rapid frequency excursions with your no-tune transceiver. Another possibility is to replace that single-wire dipole with a broadbanded antenna. What follows are some examples of relatively simple broadbanded antennas that will allow you to operate over most, if not all, of the 80-meter band while using a coaxial transmission line and no tuner.

Two dipoles mounted at right angles to one another and cut for opposite ends of the band (Figure 1) can produce a broadbanded response. Logan claimed an swr of 2:1 or less from 3.5 to 4 MHz for such an antenna, with dipole 1 resonant at 3.56 MHz and dipole 2 resonant at 3.94 MHz.[1] If you have the room to mount two 80-meter halfwave dipoles at right angles to one another, this is an easy way to improve the swr bandwidth of your 80-meter antenna system.

A somewhat similar wideband antenna credited to ZS6ZO uses two dipoles cut to the center of the band and fed 90 degrees out of phase from one another via a quarter-wavelength phasing line (Figure 2).[2] Once again, the two dipoles are mounted 90 degrees apart. The reported bandwidth with this antenna was approximately twice that of a single dipole alone, thereby covering most of the 80/75-meter band.

What is probably my favorite in this class of antennas is one that's been around for a long time: the cage dipole (Figure 3). This uses several wires to simulate a conductor of large diameter. Increasing the conductor diameter produces an antenna whose reactance (and swr) varies less with changes in frequency than it does with a "skinny" antenna.[3] The increased diameter also means that these antennas are shorter than a single-wire dipole tuned to the same frequency. For instance, a cage dipole that I used for a number of years had 4 conductors spaced 2 feet apart and was 117' long. Mounted 80 feet above ground, it was resonant at 3800 kHz and provided a 2:1 or better match across the band. Harbach, using a 115' antenna with 4 conductors spaced approximately 4 feet apart, reported similar results.

When assembling a cage dipole you must make allowance for the increased wind area relative to an ordinary dipole—you now have 3 or more wires plus spreaders—so

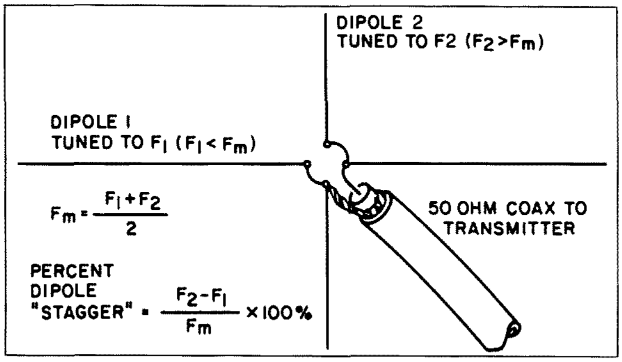

Fig. 1. Top view of the broadband stagger-tuned, crossed dipole antenna.

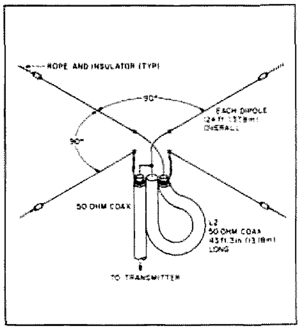

Fig. 2. The 80m wideband antenna at ZS6ZO. Two dipoles spaced 90 degrees apart are fed 90 degrees out-of-phase with an electrical quarter-wavelength interconnecting line. Shields of lines are all soldered together at dipole feedpoint and connected to adjacent antenna sections.

plan accordingly when choosing wire and insulators. I used #14 wire for my antenna, and experienced no mechanical failures. The spreaders were fashioned from some Plexiglas™ that I had on hand at the time. However, they could be made of wood or PVC. Conductors such as angle aluminum have also been used for spreaders, although some claim that doing so increases the antenna Q and hence markedly decreases bandwidth.[5]

Attempting to erect a cage dipole in an area cluttered with underbrush and overhanging limbs can be a nightmare (trust me, I've tried it), but If you can suspend one wire near ground, build the remainder of the antenna around that wire, and then pull the complete assembly into position, the task is not especially difficult.

Another dipole cousin is the fan dipole.[6] As can be seen in Figure 4, each side of a fan dipole consists of two arms 55 feet long, spaced 12 feet from one another at the ends, and joined at the center. The antenna is 110 feet long, causing it to have a capacitive reactance on 80-meters. To compensate for that reactance, a reactance of opposite sign (i.e., an inductor) is connected across the antenna terminals (see Figure 4 for details). This procedure also

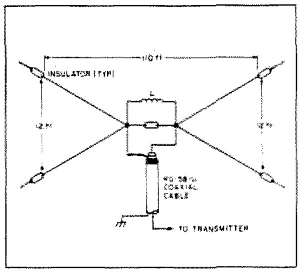

Fig. 4. Broadband fan dipole for 80m. Wires may be either in the horizontal or vertical plane. The inductive reactance (X_L) is 64 Ohms. At 80m, L = 2.7 uH; this is achieved by winding 8-1/2 turns of #12 wire around a 2"-long, 2"-diameter tube.

transforms the resistive component seen at the antenna to approximately 50 Ohms.

W7IS, has his own version of a wideband dipole for 80-meters (Figure 5).[7] As you can see in the illustration, he uses five equal length wires connected in parallel for each leg of the dipole. The wires are spaced approximately 2 feet apart, with no spreaders being used. W7IS claims an swr of less than 2:1 over the 80-meter band with this antenna. Although he used a 1:1 balun at the feedpoint of this antenna, I suspect that it would work equally well with direct coax feed.

The discone and conical monopole (Figures 6 and 7) are two wideband vertically-oriented antennas that not only covers all of the 80/75-meter band with a low swr, but works well over several adjacent amateur bands. Their shortcoming is that they take up considerable real estate when designed for the lower HF bands. Due to their limited application, interested readers are referred to the ARRL Antenna Book (edition 13) and an article by Stan Gibilisco W1GV/4 in the May 1985 issue of *73* for further details.

The antennas discussed above certainly do not constitute an exhaustive list of the wideband antennas that can be used on 80-meters. However, they do provide some examples of how you can erect an antenna that yields a relatively low swr over the

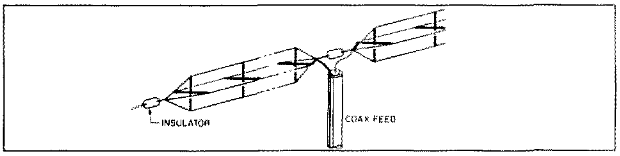

Fig. 3. Cage dipole. The spreaders are spaced at 10-15' intervals.

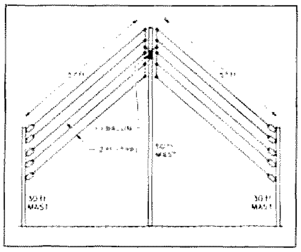

Fig. 5. W7IS's 80m wideband dipole.

3.5 to 4-MHz range. And don't forget that these antennas can also be scaled for use on the other amateur bands that have relatively large bandwidths, such as 160 and 40 meters. So, give one of these antennas a try and free yourself from antenna-tuner slavery. I'm interested in hearing how they work for you and what new ideas readers have for these (and other) antennas. ■

References

1. Logan, Mason A., "Stagger-tuned dipoles increase bandwidth," *Ham Radio*, May 1983, p.22-24

2. Orr, Bill, "Ham radio techniques—the ZS6ZO wideband 80-meter antenna," *Ham Radio*, June 1984, p.60

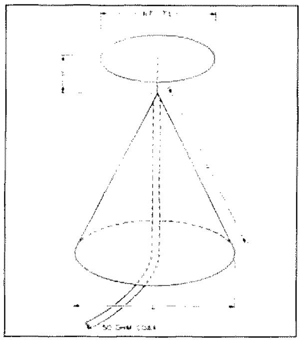

Fig. 6. Discone antenna. L = wavelength/4 (free space) at lowest operating frequency. S = 1-6 inches.

3. The *ARRL Antenna Book*, ed.13, p.30

4. Harbach, Allen B., "Broadband 80-meter antenna," *QST*, December 1980, p.36-37

5. Johnson, David C., "Technical Correspondence—Cage antennas," *QST* November 1983, p.61

6. Orr, Bill, "Ham radio techniques—broadband dipoles," *Ham Radio*, October 1983, p.66

7. Orr, Bill, "Ham radio techniques—a wideband 80-meter antenna," *Ham Radio*, July 1987, p.57.

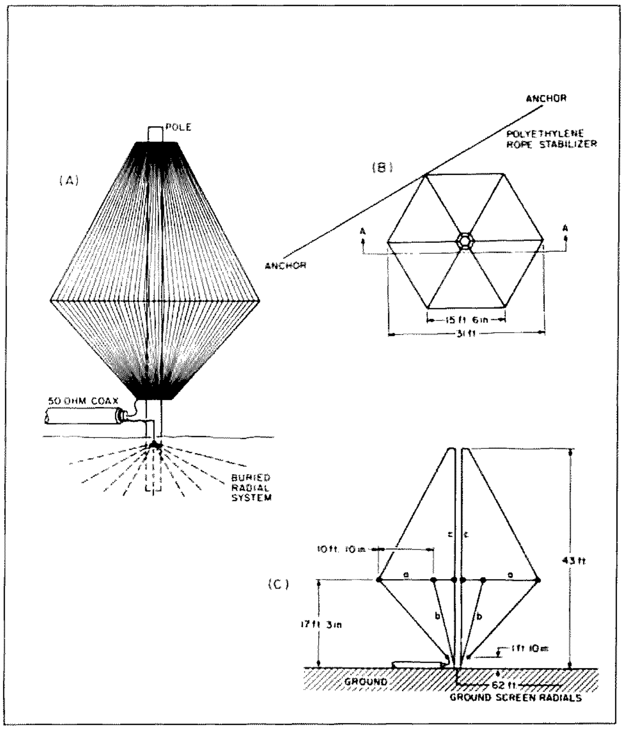

Fig. 7. The conical monopole antenna. At B, top view shows the dimensions for 3.5-14 MHz. At C is shown the side view of the conical monopole at section A-A. Note that the grounding stubs, b, *connect to the short radial wires,* a. *Wires* c *run up the sides of the supporting pole, which is unguyed.*

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SPECIAL EVENTS

Ham Doings Across the Country

CHICAGO IL
OCT 31-NOV 1

The A.R.R.L.'s Central Division is having its 1987 convention as part of a "Hamtastic Weekend" sponsored by one of the country's oldest clubs, the Fox River Radio League. The event will be all under one roof in the spacious Norris Sports Center just off Rt. 64 in St. Charles IL. The site is about 35 miles west of Chicago. All events including a flea market are fully accessible for wheelchairs.

This is the second consecutive year that the Central Division has been part of this popular hamfest. In addition to commercial exhibits and sales there will be an indoor flea market and many forums, seminars, and technical demonstrations. Exams will be given for all classes of licenses.

The hamfest/convention hours are 8 a.m. to 2 p.m. both days, Saturday and Sunday, October 31 and November 1. Sellers may set up 7 p.m. to 9 p.m. Friday, 6 a.m. Saturday, and 7 a.m. Sunday. Tickets good for both days are $3 in advance and $4 at the door. For advanced tickets or information on tables or exams, contact Phil Fors N9FXQ, 104 May Street, West Chicago IL 60185, or phone 312/231-8841. A SASE will be appreciated. Talk-in will be 145.47 (-600) and 145.21 (-600).

GRAYSLAKE IL
NOV 1

Waukegan C A P will hold its 7th annual hamfest at the Lake County Fairgrounds, Rts 120 and 45, Grayslake IL on Sunday, November 1, 1987, from 7 a.m. to 5 p.m. Large indoor flea market, cafeteria, free parking. Tables $5, donations $3. For reservations and information send a SASE to CAP, 637 Emerald St., Mundelein, IL 60060.

SELLERSVILLE PA
NOV 1

The RF Hill Amateur Radio Club, serving the Bucks and Montgomery County areas of Pennsylvania, will hold its 1987 hamfest on Sunday, November 1, 1987 at the Pennsylvania National Guard Armory, PA Route 152, Sellersville, PA.

Doors open at 6 a.m. for sellers, 8 a.m. for the general public. Entry is $4, accompanying spouse and children are free. This year there is expanded space both indoors and out due to a recently completed improvement project at the Armory.

Indoor space will be $8, and outdoor will be $6. Talk-in on repeaters at 145.31, 145.19, 146.88 and 146.52 simplex. To reserve space write: Hamfest Chairman, 523 Vine St., Perkasie PA 18944.

SOUTHFIELD MI
NOV 7

AMSAT, Radio Amateur Satellite Corporation is holding its 5th Annual General Meeting and Space Symposium on Saturday, November 7, 1987 in suburban Detroit at the Southfield Hilton. Featuring Dr. Tony England W0ORE, Shuttle Astronaut and Space Station Program Scientist. There will be a banquet, lectures, seminars and tutorials, displays and exhibits, live demonstrations, sessions for beginners and novices, handouts and other literature. For additional information and registration forms write to: AMSAT, PO Box 1091, Ann Arbor MI 48109-1091.

LOGAN WV
NOV 7-8

The Logan County ARC will hold its seventh annual "Mountain State Award" expedition from 1600 UTC November 7 until 0200 UTC November 8. The call sign will be NU8K. Operations will take place on a West Virginia mountain-top in Logan County, which is located in the heart of southern West Virginia's billion dollar coal fields. The phone operating frequencies will be approximately 25 kHz from the low end of the general phone bands as propagation allows.

A handsome 8"x11" certificate will be awarded to all contacts submitting a QSL and legal size SASE to: Roy Elkins NU8K, PO Box 202, Monaville WV 25636.

HINES IL
NOV 8

In observance of Veteran's Week, members of the Hamfesters Radio Club, Chicago, will operate from the Hines V.A. Hospital's Robert K. "Pappy" Wade K9CDH Memorial Ham Shack using the Hine's club call K9WFN from 1500Z to 0300Z, Sunday November 8. The club will operate on 40 meters, 20 meters, 2 meters FM and 2 meters USB. Frequencies to be used are 14.260, 7.260, 146.43 simplex, 144.210 USB. Please send QSL, QSO number and a 9x12-inch SASE with $.39 postage or $1 to: Hamfesters Radio Club, Chicago, %Robert K. "Pappy" Wade Memorial Ham Shack, Bld. 8, Hines Veterans Administration Hospital, Hines IL 60141 for a commemorative certificate.

FORT WAYNE IN
NOV 8

The Allen County Amateur Radio Technical Society will present the 15th Annual Fort Wayne Indiana Hamfest on Sunday, November 8, 1987 at the Allen County Memorial Coliseum on Coliseum Boulevard (U.S. 30). 450 tables available, all indoors. Dealer setup begins 5 a.m. Doors open 8 a.m. to 4 p.m. General admission $3.50 advance, $4 at the door, children 11 and under free. Tables $10 each. Premium $25 each. Plenty of parking on paved lot. Women's activities in a new, larger area. Forums. Talk-in on 146.28/.88. Motels and restaurants nearby.

VE examinations given Saturday, November 7th with advance registration only. For more information on reservations contact AC-ARTS HAMFEST, PO Box 10342, Fort Wayne IN 46851. For information ONLY, contact Bernie Holm K9JDF, Hamfest Chairman at 219/485-0164 between 6 p.m. and 10 p.m. EST

MILWAUKEE WISC
NOV 14

The Milwaukee Repeater Club is proud to sponsor the 3rd annual "6.91 Friendly Fest" on Saturday, November 14, from 8a.m. to 1 p.m. (sellers admitted at 7 a.m.), at the newly-expanded Serb Hall, 51st and Oklahoma Ave. The selling halls will be located entirely on the ground floor with easy access so, rain or shine, gather up your swapfest bargains and come share our famous Milwaukee hospitality. Tickets are just $3, tables are $4. To save $1 per ticket or table—send SASE with payment to The Milwaukee Repeater Club, PO Box 2123, Milwaukee WI 53201, before November 7. Talk-in on 146.91- (The Friendly Repeater) and on 146.52. On-site Amateur Exams.

MONTGOMERY AL
NOV 14-15

The Montgomery Amateur Radio Club will host the 10th Annual Central Alabama Montgomery hamfest at the Ed Teague Arena at the Central Alabama State Fairgrounds near the Coliseum. Free admission, free parking, plus overnight RV parking with hookup ($5/night). Flea market and dealer set-up available Friday night 7 p.m. to 10 p.m. and beginning Saturday and Sunday at 6 a.m. Tables are $5 each day or $7 each for both days, reservations are not required. Doors open to the public from 9 a.m. to 4 p.m. Novice through Extra Class FCC license exams both days beginning at 9 a.m. Bring a copy of current license for upgrades. Talk-in information on 146.24/84, W4AP/RPT. Other local repeaters available on 147.78/18, 449.50/444.50 and 146.32/92 with autopatch. For more information write to: Montgomery Hamfest at PO Box 3141, Montgomery AL 36109 or call Randy at 205/832-4598 or Ken at 205/271-0028.

NORTH HAVEN CT
NOV 15

SCARA indoor ham radio and computer flea market. Sunday, November 15, at the North Haven Park and Recreation Center, 7 Linsley Street. Sellers admitted at 7 a.m., buyers from 9 a.m. to 3 p.m. Tables are $10 in advance, $15 at the door. General admission $2 per person. Talk-in on 146.01/.61. Reservations for tables must be received by phone. For information or reservations, SASE to: SCARA Flea Market, PO Box 81, North Haven CT 06473, or call between 7 p.m. and 10 p.m. Brad at 203/265-6478.

ROCKFORD IL
NOV 15

The Rockford ARA and Experimental ARS will sponsor the 1987 Rockford Hamfest/Computer Fair in conjuction with the Illinois State ARRL Convention, to be held at the Forest Hills Lodge, 9900 Forest Hills Rd., on November 15 from 8 a.m. to 4 p.m. Features ARRL forums, radio and computer technical programs, VE exams, dealers, flea market. Free parking. Wheelchair accessible. Admission $3 in advance, $4 at door. $5 for indoor flea market tables, $2 outdoor tailgating. Talk-in 146.01/61 and 146.52. Contact: Roger Sawvell KD9MQ, 6514 Swansdown Drive, Rockford IL 61111 (815/282-1283).

BILLERICA MA
NOV 21

The Honeywell Bull 1200 Radio Club, sponsor of 147.72/12 repeater and the Waltham Amateur

Radio Association, sponsor of 146.04/64 repeater will hold their annual amateur radio and electronics auction on Saturday, November 21 at the Honeywell Bull plant, 300 Concord Road, Billerica MA Exit 27 off Route 3. Snack bar and bargain parts store. Doors open at 10 a.m. Free admission and parking. Talk-in on both repeaters. For more information contact Doug Purdy N1BUB, 3 Visco Road, Burlington MA 01803.

GREENSBORO NC
NOV 21–22

The 7th annual Greensboro, North Carolina Hamfest, sponsored by The Mark IV Radio Club. November 21 and 22. Franklin Blvd. - National Guard Armory, 9 a.m. to 5 p.m. Tickets $4 in advance, $5 at gate. New tailgate area - price of ticket plus $2 per space. Walk-in FCC exams. Free shuttle bus to largest shopping mall on the East Coast - Saturday. Information and registration: Fred Redmon N4GGD, 3109 Goodall Drive, Greensboro NC 27407 - Phone: 919/852-9244. Tickets Only: Henry Hughes KA4LPA, 2811 Gwaltney Road, Greensboro NC 27407. FCC exams: Hugh Brunson AE4N (919/852-1087).

ORMOND FL
NOV 21–22

In celebration of the annual Birth Place of Speed text1 Commemoration and Gaslight Parade, the Daytona Beach Amateur Radio Association will operate K4BV from 1 p.m. to 8 p.m. November 21 and 22. Operation will be in the novice bands and lower 25 kHz of the general phone bands, 147.150 2 meters and packet with digi 904DAB. For special certificate after contact, send SASE to: DBARA, PO Box 9852, Daytona Beach FL 32015.

WEST PALM BEACH
NOV 21–22

Palm Beach Repeater Association presents the First Annual Hamfest '87, Amateur Radio and Computer Show. Starting on November 21 at 8 a.m. to 5 p.m. and on the 22nd at 8 a.m. to 3 p.m. , it will be held at the South Florida Fair Grounds, Southern Blvd., (State Rd. 80), in West Palm Beach, Florida. There will be the latest in commercial exhibits, FCC exams, swap tables and a QCWA Luncheon. The talk-in frequencies will be 146.52/.52 (PBRA: 147.165/.765).

For table and/or RV reservations information, write to Hamfest, PO Box 461, Lake Worth FL 33460. (Cutoff date Oct. 31)

ST. PETERSBURG FL
NOV 21–22

On Saturday and Sunday, November 21 and 22, the new St. Petersburg Hilton and Towers will be the site of the South Florida ARRL Suncoast Convention sponsored by the Florida Gulf Coast Amateur Radio Club Council. There will be a huge flea market and commercial booths all indoors. Amateur exams will be administered at the convention Saturday the 21st. Frank Butler W4RH, Southeastern Director ARRL will participate in the convention activities. Also on Saturday there will be the usual QCWA noon luncheon. Interesting programs are planned with technical talks and demonstrations of the latest methods of amateur communications. There are also planned club and traffic net get-togethers.

Registration tickets will be $4 until November 13th after that $5 at the door. Make checks payable to FGCARC and mail to 1556-56th Ave., No. St. Petersburg FL 33703. Hilton and Towers rooms will be $60, write or call Hilton and Towers, 33 1st Street, So. Street, St. Petersburg FL 33701 or phone 813/894-5000 and mention the convention. (Do not use the 800 number) There will be unlimited parking at the hotel and nearby.

QRP

Low Power Operation

Mike Bryce WB8VGE
[illegible]225 Mayflower NW
Massillon OH 44646

TWO-FER CONSTRUCTION

At the 1986 Dayton Hamvention, the QRP ARCI (Amateur Radio Club, Inc.) and members were so impressed with GM3OXX's "oner" that we also organized and constructed a club project. Mike Michael W3TS and John Collins KN1H volunteered their skills in designing, testing and producing an easy-to-build transmitter. The club set these criteria: 1. The project must be easy to build 2. No special "NASA"-type parts are to be used 3. Small size 4. A contest chairman to organize an on-the-air event using the club's project. When the meeting was over, enthusiasm was running high with all those that attended.

John and Mike, joined by myself and others, did most of the design work over the air. In a few months, the "Two-Fer" was born.

In keeping with the club's guidelines, here is a project for the first-time builder. There are no special parts. A PC board is available (more on that later), but the so-called "ugly" construction works just fine. The transmitter has an output of about 2 Watts; more than enough for coast-to-coast operation. While the Two-Fer is crystal-controlled, the crystal's frequency can be shifted via the on-board vxo. So gang, it's time to get the soldering iron out again!

The Two-Fer

The Two-Fer is really both a transmitter and a direct-conversion receiver. With correct packaging, the entire project will almost fit into a two cubic-inch space. In this column, we'll look at only the transmitter side.

The schematic of the transmitter is shown in Figure 1. A Pierce oscillator is used. Aside from its obvious simplicity, it is used because it doesn't have parallel capacitance. This means that the variable capacitor on the gate will change the oscillator frequency from about 4 kHz on 80 meters to 15 kHz on 20 meters.

As with most vxo systems, the amount of swing will depend greatly on the type of crystal used. In almost all cases, the old dependable FT-243 will *not* work. They will, of course, oscillate, but you'll find you can't swing their frequency by much. Best results come from the HC-17/U- and HC-32/U-type crystals.

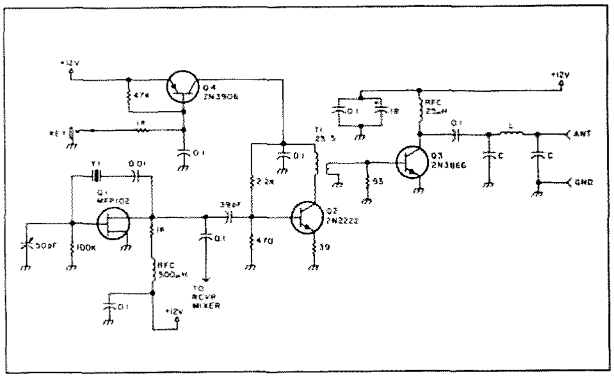
The rfcs are not especially critical. The oscillator choke can be any value from 100 uH to 1 mH. The PA choke can be made by winding 24 turns of #24 wire on an FT-37-61 core. Radio Shack sells a 10-uH choke that works super for the PA.

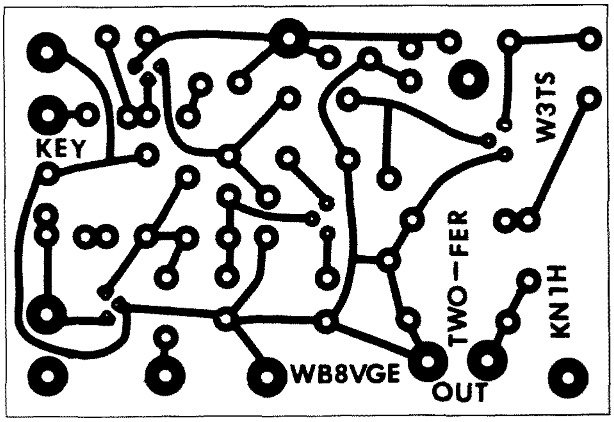
Raid the junk box for the transistors. The PA transistor may be hard to find. The 2N3866 is the most common, but this device is really too "hot" for the Two-Fer. This transistor will work extremely well at frequencies around the UHF band, but sloppy construction will cause the 2N3866 to oscillate in that band, causing all types of TVI. Left uncontrolled, the device will have a short life.

I find it is best to use the 2N3553. I have used the PA transistors from scrapped CBs and have had extremely good results. The pin out of the board will not match those of the TO-220 case transistor, but you can always bend the leads to fit. No matter what transistor you finally decide on for the PA, be sure to heat-sink it, as they will run warm.

The transformer is constructed by winding 25 turns of #24 wire on a T-50-2 core. The secondary is 5 turns wound over the primary.

Because of the broad-banded nature of the Two-Fer, testing is quite simple. After checking your work over for wiring errors, connect a dummy load to the output. Disconnect the external vxo capacitor for the time being, as extra capacitance may keep slow crystals from operating. Install crystal and key. Apply power and key down. Notice that we have nothing to tune. You should see about 1-1/2–2 Watts, depending on the supply voltage, crystal and band used. If you have access to a frequency counter, lightly couple some rf into the counter. The crystal's frequency should be read. Power down and connect up the vxo capacitor. Power up, and this time monitor the counter. As the vxo capacitor is turned, the frequency should swing. With the counter you can tell just how much swing you will get from that crystal. Use your station receiver to monitor the output of the Two-Fer.





Figs. 1 and 2. Schematic and PCB layout for the Two-Fer transmitter.

Covering the Bands

Up to now, I made no mention of bands covered. Well you have a choice! Table 1 shows all the values for the output filter. Change crystals, filters, and you're on a new band. The components exchanged are the two capacitors and the coil on the pi network (the circuit to which the antenna and ground directly attach). The caps are all silver mica, and the wire for the coils is #22. One could easily build the filters into plug-in units, changing them as you change bands. ■

Band	Filter Caps	Filter Coil
20m	220pF	21 turns
40m	470pF	14 turns
80m	860pF	10 turns

Fig. 3. Values of the pi-network LCs for 20, 40, and 80m.

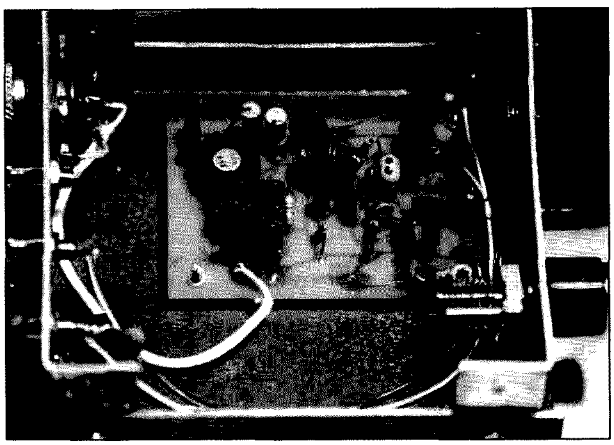


Photo A. Inside the transmitter.

73 INTERNATIONAL

edited by Richard Phenix

John Felber K2BPR, in China.

NOTES FROM FN42

We now have an official Olympics '88 correspondent (see Republic of Korea, below). Any amateur radio Olympics information will be welcome here, however, to be shared with all readers. Mark envelope for 73 International.

A report from VP2MO, printed below, was received with pleasure—it had been some time since he last wrote—and his absence was explained in a casual and offhand manner. He has been busy "fitting into my new position," which turns out to be one newly created to handle all of the "day-to-day matters pertaining to telecommunications" and reporting directly to the Minister of Communications and Works. This includes, of course, all amateur radio matters. Congratulations to VP2MO!

Four National Days in November: 1—Algeria and Antigua, 19—Oman, and 24—Zaire; five Independence Days: 3—Panama, 18—Morocco, 22—Lebanon, 25—Suriname, and 28—Albania.

Other notable days for you to mention when you make those DX contacts: 3—Culture Day, Japan; 4—Flag Day, Panama; 5—First Cry For Independence Day, El Salvador; 6—Green March Day, Morocco; 7—October Revolution Day, USSR; 8—Queen's Birthday, Nepal, and Remembrance Day in Great Britain. It is Remembrance Day in Canada on the 11th (which is Veterans Day, USA, and Armistice Day in France), and in Bermuda on the 12th.

On the 14th it is Dynasty Day in Belgium; 15—Volkstrauer Day, Germany, and Proclamation of the Republic Day, Brazil (and the same in Yugoslavia on the 29th); 17—Army Day, Zaire; 20—Revolution Day, Mexico; 23—Labor Thanksgiving Day, Japan; and the 24th is Thanksgiving in the USA.

ROUNDUP

Australia. Time for the A.L.A.R.A. Contest again. (NOTE: Australians: Use locally issued instructions for additional necessary details!) Everybody eligible; YLs work everyone, OMs work YLs only; combined phone and CW, 0001 UTC through 2359 UTC November 14, suggested frequencies 28.100-28.350, 21.100-21.200, 21.350-21.370, 14.060-14.235, 7.100-7.120, 3.525-3.590. Each station may be counted twice on each band (once for phone, once for CW); no net or list operation, no crossmode. Contacts must be in accordance with operator and station license regulations. Call CQ ALARA CONTEST (phone), and on CW YLs call CQ TEST ALARA and OMs call CQ YL. Exchange: RS or RST, serial number beginning with 001, name; ALARA members add ALARA member before name. Logs: Single log entry, date/time (UTC), band, mode, callsign worked, RS(T) & Serial No. sent, ditto received, name of op worked, points claimed. Scores: 5 points for ALARA member contacted (logged, for SWLs); 4 for YL non-member contacted (logged); 3 for OM contacted. Double all points for CW contacts. Must sign logs, showing your full name, callsign and address; no carbons, must be legible; logs will not be returned. Contest Manager decisions final. Logs must be received by December 31, 1987, by Mrs. Marlene Perry VK2KFQ, 31 Cadell St., Wentworth 2648, N.S.W., Australia. A trophy will be given for the highest aggregate score over 5 years (1983 on) of any licensed YL op. Certificates for top scores: overall; Australian YL Novice CW; ALARA member each country and VK call area; YL non-member, each continent; OM, each continent; VK Novice; overseas YL Novice CW.

Brazil. Anyone lucky enough to have worked Steve NN7X/PY1ZBH from last July 1 to 10 from his DX location on Fernando de Noronha should QSL by SASE to PY1ECL, 86/87 *Callbook*, according to PY1CC—another report from whom will be published soon. He covers the F de N DXpedition.

China. John E. Felber K2BPR of *International Intertrade Index* sends us this picture of himself at the key of B7MC, aboard the *M.V. Yangzijiang* (Yangtze River) at Chongqing, with Cai Chu-ming, of Shanghai's BY4AA radio club. The rig is a 200 Watt CW on 6.5 MHz.

Chang Han Dong, our People's Republic of China correspondent, reports that he now IDs himself on the air (BY4AOM and other stations) as Hans. He reports also that he had a surprise gift from the ARRL—it has made him an Associate Member for a year ending next July. He thinks maybe the honor came to him as a result of his becoming a correspondent with us, and says "Please be sure to send my heartfelt gratitude to the ARRL." Another report from Han Dong will be published soon.

Germany. Hans-Juergen Schalk DJ8BT sends us information about the 6th DARC FAX Contest. See box on page 94.

Great Britain. *Shortwave Magazine* carried a four-page story on "The Biggest Radio Event In The World" in its July issue—"The Dayton Hamvention 1987," by Rev. G.C. Dobbs G3RJV. It was more than the title suggests: G3RJV did his homework and gives a delightful account of the history of the event as well as a complete description of the 1987 version. It also is complimentary. "In doing or seeing what I wanted, I was never defeated by lack of information or advice, just weariness."

Greece. Dr. Agis Sarakinos SV1ACS/W5WB invites "anyone in the USA who speaks Greek to join us [a group of former US hams now living in Greece] on 14285 kHz every afternoon 1700-2200 Greek time." He also asks associations of hams with common interests (handicapped hams, Rotary, Masonic, Boy Scout, Red Cross, etc. hams) to get in touch with him. Write him at the National Technical University of Athens, 4 Chiou, Chalandri, Athens, Greece 15231.

Ireland. Representatives from EI also reported favorably on the Dayton event in the newsletter of the Irish Radio Transmitters Society (PO Box 462, Dublin 9, Ireland). The address is given in case any ham club officer (or member) wants to send for the *IRTS Yearbook* for 1987/8 to see an outstanding example of what a club can do on behalf of the hobby in general and its own members in particular. 5-1/2" x 8-1/2" on glossy stock, 50 pages are devoted to IRTS information (regions, license information, visitor licenses, awards and winners, affiliated clubs' reports, the emergency network, contest and field day rules, QSL services, repeaters, band plans, and IRTS personnel, programs, and reports.) It is clear that new and potential hams are welcomed and get help from the IRTS. (The last 50 pages list EI callsigns.) If you want to take a stab at sending your money for one, figure out the equivalent in your currency for four pounds—3 pounds 50 pence for the book and 50 pence for postage (surface mail). Or write first—they may not have extra copies available.

The September issue lists recommendations to Region I, IARU, some of which are: For Packet Radio a frequency shift of 200 Hz should be used for 300 baud transmissions using FSK; for FM AFSK Packet Radio at 1200 baud, audio frequencies of 1200 and 2200 Hz should be used, as in the Bell 202 standard; the following footnote shall be included in the Standard for Digital Communications: "It is recognized that in the future higher data rates will be achievable through the use of different modulation methods. It is recommended, however, that in all cases for the frequencies used for communication between the user and a network access point, the bandwidth of the transmission

DEUTSCHER AMATEUR-RADIO-CLUB E.V.

Mitglied der IARU

REFERAT BILD- UND SCHRIFTÜBERTRAGUNG

6 th DARC FAX CONTEST 1987

The German Amateur Radio Club (DARC) has the great pleasure to invite FAX Radio Amateurs worldwide to participate in the 6 th DARC FAX Contest 1987

Test period: Saturday, October 31st 1987, 08.00 UTC thru Sunday, November 1st 1987, 20.00 UTC

Classes: A: HF-bands 3.5, 7, 14, 21, 28 MHz
B: VHF/UHF-bands, 144MHz and up (Repeater traffic not allowed)
C: FAX receiving stations (SWL), all HF- and VHF/UHF-bands

A participant can work all bands according to his license privilegies, however, to qualify for the contest it is necessary to select o n e class only. Also, single Call and single QTH participation are required only.

Exchange: Name, QTH, RST and QSO-Number. FAX-mode is permitted only.

Points: One point is given for each confirmed FAX-QSO. (SWL one point for each received FAX station). A station may be worked only once per each band.

Multipliers: Each different country worked on each band gives a multiplier of one. The current European- and ARRL-countries list will be used. In addition each JA, PY, VE/VO, VK, W/K, ZL, ZS and UA9-0 call area will be counted as a seperate country.

Scoring: Final score will be computed from total QSO points multiplied by the sum of all band multipliers.

Logs: Should contain all exchanged information, participation class and final score.

Deadline: All logs must be received on or before December first, 1987, in order to qualify.

Manager: Hans-Juergen Schalk, DJ8BT,
Hammarskjoeldring 174
D-6000 Frankfurt 50, West Germany.

Awards: Certificates for top scorers in each classification indicated as above. Additional honorable mention certificates will be awarded according to the number of entries presented.

FAX frequencies: 3601, 7040, 14101, 14232.5, 21150, 28200 kHz (+/-5)

should not exceed 12 kHz, i.e., the bandwidth of an FM channel with 25-kHz spacing. For links between packet network nodes, higher data rates and larger bandwidths may be used. For such high speed (greater than 1200 baud) links, FM AFSK is not preferred." With respect to bandplans: In the "usage" section of the 144 MHz bandplan, the section 144.625 to 144.675 MHz shall be designated "Digital Communication." AFSK FM modulation shall be allowed in this section....In the "usage" section of the 432 MHz bandplan, the following sections shall be designated "Digital Communication": 430.600–430.800 MHz, 433.625–433.775 MHz, and 438.025–438.175 MHz....145.225 MHz (S9) shall be added to the 144-MHz bandplan as an FM simplex frequency.

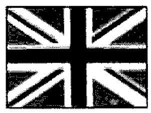
Italy. 10 meters is coming back, and Mario Ambrosi I2MQP, now Secretary General for the Italian Amateur League [*Many congratulations!*] reminds us about the IY4M Beacon Robot—the Marconi Memorial Beacon Robot. For full particulars, see this column in the February, 1987, issue of this magazine, where DJ3NW of West Germany did a fine reporting job.

Manuel F. Calero I4CMF of the IARS Reciprocal Licensing Unit (Via Giorgione, 16–40133 Bologna, Italy) tells us of the first reciprocal agreement to be signed with a country in Central and South America: Venezuela. He also sends "Terms and Conditions" for temporary licenses for foreigners, effective July 1987. Too long to report on here, they may be obtained from the address given above or, more rapidly, from the ARRL in Newington.

U.S.S.R. An historic publishing agreement has been reached between the U.S.S.R State Committee for Publishing and Printing and the International Data Group (IDG—parent company of Wayne Green Enterprises) of Framingham, Massachusetts. *PC World U.S.S.R.* will be published beginning in early 1988 as a joint operation of Radio i Svyaz and IDG Communications. This is a pioneer implementation of the Supreme Soviet Decree of January, 1987, on joint ventures. As the world's leading publisher of computer-related newspapers and magazines (90, in 33 countries), IDG states that its 14 million readers will benefit by direct access to information about the progress of technology in the U.S.S.R. The PC market in the Soviet Union is expanding rapidly. For example, over a million microcomputers will be sold in the Soviet school system in the next three years. IDG's Axel Leblois said, "There is clearly a serious commitment in the Soviet Union to enact economic reforms, and to build successful relations with foreign partners."

Zimbabwe. Jamboree of the Air operators note: 1987 is the 75th Anniversary of the Girl Guide movement, so JOTA stations will, no doubt, give this event attention; watch for Zimbabwe.

The new Z2 Award is now available. All DX stations work 5 Z2s; Zone 38 stations work 10; Z2 stations work 15. Any band, any mode. Send US$1.00 or 10 IRCs with certified log extract (no QSLs) to Z2 Award, PO Box 2377, Harare, Zimbabwe.



BRITISH WEST INDIES
MONTSERRAT

Errol "Bobbie" Martin VP2MO
PO Box 113, Plymouth
Montserrat, British West Indies
Leeward Islands, Zone 8

CHANGES IN VP2M-LAND

As mentioned in the Roundup section, above, VP2MO is now the officer in the Ministry of Communications and Works who is responsible for all ham radio matters.

With ham license matters now the responsibility of one man rather than one of several responsibilities of one individual, processing and dealing with amateur radio matters has markedly improved, and it is the intent of the Administration to continue its good relationship with the amateur radio fraternity at large.

It has been noted, however, that many persons have been using Form "A" for applying for a permit to operate here. This should be discontinued, and the proper form used. [*See illustration to guide your creation of a dated letter of application if you have no form*]. Under #8, list only the other callsigns you may now possess—not one that you want. Use space at the bottom of the form for any special requests.

Mail the application along with two recent passport-type photos, a photocopy of the present license held, and a bank draft or bank-certified check for "the amount of approx. US$7" made out to "The Accountant General." Be sure to allow enough time so that you have your license to operate *before you leave on your trip here.* This is important, particularly if you are bringing in any gear. Allow more than a theoretical minimum of two months. The longest part of the process is waiting for the check to clear—treasury regulations require this. [*Editor's Note: Why not risk eight bucks cash, indicating in your correspondence that you have done so? The risk is small, you'll get your change, and save a big slice of time. This is free advice—so feel free not to take it!*]

About obtaining a VP2M callsign: The fact remains that it is the intent of our local administration to preserve all resident callsigns, but there is no hard and fast rule. Each application will be reviewed and dealt with on its own merits. Unlike other independent countries, we have only the one prefix, so differentiating between residents and visitors we have only the option of the portable, which is a common way of doing it, internationally. We do tend to favor granting a VP2M call, however, for visitors who come here regularly for contesting, for example. We can appreciate wanting to have the feeling of "being a part of" some other country by having a resident callsign.

On the other hand, look at our licensing system. All licenses expire every December 31st and have to be renewed *at the beginning of the next year.* (So do drivers' and other licenses.) So, since January 1 is a holiday, and licensing offices are closed, operating (or driving, etc.) is technically illegal. If we operate on that day without a valid license is it legal? If anyone works a VP2M station on that day and gets a QSL card, is in valid for DXCC? You bet your ever-loving COAX it is!

The licensing authorities are aware of the situation and allow it to continue. To allow is to permit, right? And does this administration have anyone else to satisfy besides itself? Hell, no, and it couldn't care less what anyone else thinks. The administration has NOT declared anything about this operating to be illegal. Understand?

VP2MO's report will be continued in a future issue. He shares his feelings that hams everywhere

must have better manners on the air and promote friendships around the world.

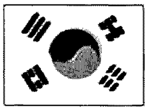
APPLICATION FOR A LICENSE TO OPERATE AN AMATEUR RADIO STATION—MONTSERRAT, WEST INDIES

________________DATE

1. Applicant's name:
2. Home address:
3. Birthdate:
4. Place of Birth:
5. Nationality:
6. Evidence: [Copy of passport or birth certificate]
7. Class of amateur license held:
________________CALLSIGN
8. Do you hold any other station license? List: [See text]
9. Proposed station location on Montserrat:
10. Amateur band(s) proposed for use:
________________Modes
________________Maximum input power
11. Description of radio equipment which will be brought to Montserrat or used:
12. Estimated time of arrival:

I HEREBY DECLARE THAT THE ABOVE IS A TRUE STATEMENT, THAT I UNDERSTAND AND WILL ABIDE BY ALL LICENSE TERMS, PROVISIONS, CONDITIONS, AS PER RULE 3 OF THE TELECOMMUNICATIONS ACT OF 1949—REVISED EDITIONS OF THE "LAWS & ORDINANCE CAP 192 OF 1959 OF MONTSERRAT."

Name of Applicant (print or type)
Signature of Applicant
Date



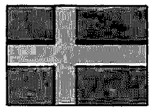
REPUBLIC OF KOREA

Byong-joo Cho HL5AP
PO Box 4, Haeundae
Pusan
Korea 607–04

We are naming HL5AP as a Special Olympics-88 Correspondent for this column; his callsign for the period of the games will be HL88AP. (For more information about HL5AP see this column for April, 1987.) Following is his first dispatch to us.

The Ministry of Communications (MOC) of the Republic of Korea (ROK) has made the following pronouncements: The basic objective of amateur radio station support for the 1988 Olympics will be to provide mobile operation of HL8N, HL8A, and HL8V at Olympic Hall, Olympic Village, and the Stadium. From September 1 to October 5, 1988, HL8N will use the call 6K88SOG (Seoul Olympic Game), HL8V will use 6K88KOG (Korea Olympic Game), and HL8A will use 6K88A for special operations.

Other club and individual stations may use 88 in their calls. Any holders of amateur licenses can operate with those three stations for communications back to their own countries (QSP). Other HL stations that have registered with the Central Office can transmit to communist countries except for North Korea, but only Olympics information may be transmitted.



SWEDEN

Rune Wande SMØCOP
Frejavagen 10
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Sweden

29 MHZ FM REPEATERS

Communication through the help of repeaters in Sweden is now a reality on the 10-meter amateur band. The Swedish licensing authority has approved six repeaters on a trial basis up to December 31, 1988. So far there are only two separate pairs of frequencies for them. Receiver (RX) input is either 29.560 or 29.580 kHz, and the transmitter (TX) is 100 kHz higher, 29.660 or 29.680 kHz.

The repeaters in Sweden (also on VHF) are identified by the club prefix, SK, followed by the number for the call area and the letter R. The last two letters in the suffix identify a specific repeater. (A similar call, but with the prefix SM—e.g., SM5RKN—would belong to a private ham operator.)

The SK5RKN 29-MHz FM repeater has been in operation since April, RX 29.580 and TX 29.680. The RX locator is JO89JK and the TX is JO89KK, which is just outside the city of Strangnas at the Lake of Malaren. They are interconnected by 1,000 meters of telephone wire. TX power is 73-Watt input and the RX includes the In-Channel Select (ICS) system for excellent separation of channels and increased sensitivity. This repeater is run by the radio club, Eskilstuna Sandaramatorer SK5LW.

Other repeaters in operation are SK6RIC (29.560 / 29.660) run by Vasa Radio Club SK5DG in Alingsas, and SK6RFQ (29.580 / 29.680) in Gothenburg, both on the southwest coast of Sweden. To activate these repeaters, you need a 1750-Hz tone. Try to whistle—that should work, too.

(SMØCOP's report will continue next month.)

PROPAGATION

Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U.S.S.R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

During many days of the month, be on the alert for VHF openings.

Expect HF conditions for the first two weeks of the month to be fair to poor. The geomagnetic field will be unsettled to active, with storm conditions possible on or near the 1st and 2nd, and again on the 9th and 10th.

The second two weeks of the month are likely to show improved conditions for HF propagation, with the geomagnetic field less active, except for the 23rd, 24th, and 25th, when conditions are likely to be poor again for the next few days.

In general, November is a good month for HF propagation with seasonal noise levels far below those of the summertime. Early darkness will insure excellent activity on the lower HF bands 160 through 40/30 meters during the evening hours, with 10 meters closing first. On some days, 15 and 20 meters will remain open into the late evening hours, local time.

NOVEMBER 1987

SUN	MON	TUE	WED	THU	FRI	SAT
1 P	2 P	3 P–F	4 F	5 F	6 F-P	7 F
8 F–P	9 P	10 P	11 F	12 F	13 F-G	14 G
15 G	16 G	17 G-F	18 F	19 F–G	20 G	21 G
22 F	23 P	24 P-F	25 F	26 G	27 G	28 F
29 F-G	30 G					

OP-ED

by Larry Ledlow, Jr. NA5E

SO WHAT?

I used to be a not-so-humble civil servant. No kidding! Earlier this year I conducted a meeting in a microscopic, windowless conference room with three other bureaucrats: my boss, my boss' boss, and a fellow who wanted to be my boss. Frankly, I didn't want to work for *any* of them. No wonder I felt a little claustrophobic.

The Turning Point

The meeting began innocently enough. I just wanted to tell everyone what a great job I had done on a project that held very little interest for me. You know. One of those I've-done-great-things-when-is-my-next-promotion meetings. Trouble popped up after about five minutes. My boss' boss—a fellow with an amazing overabundance of hair on his head—decided he didn't like the connotations of a particular phrase buried in a paragraph of a subpart of an attachment to the annex of the test plan. Stifling a yawn? So was I. "Right!" my boss said: "We'll change it right away." Then he went back to sleep. He really meant I would make the change.

I guess I missed something. I couldn't see why I had to change anything. "Why?" I simply asked. The explanation that followed stretched my imagination and patience to their outer limits. (I think that's why the head cheese had so much hair. He thought too much.) After fifteen minutes of struggling to follow a logically convoluted argument I just had one more question. "So *what?*"

Everyone sat back, stunned and eyes agog. The smallest man in the room licked his lips. He hoped his chance to get me under his thumb had come. It's that simple. Those six letters and just the right inflection, coupled with certain physical expressions for emphasis, marked a turning point in my previous life as a bureaucrat.

I didn't make the change. I didn't get promoted. I didn't go to work for the short man. I came to work for Wayne Green instead.

Tips for Authors

Half the tale is in the telling. I know most of you don't supplement your income much by freelance writing, much less make a full-time job out of it. I have some pointers, though, that may help you make a sale or two with your manuscripts.

You probably wouldn't write something down if you didn't think it was interesting or exciting. You write an article because you want to share the information with lots of people, not to mention your desire for a few extra dollars. Make a list of the things that excite you about your subject and reasons other people may want to read about it. Then build that list into an introduction for your article. Make your points immediately and up front, or most readers won't slog through the rest of the text trying to find a redeeming feature. Emphasize unique features of a project or begin with an interesting anecdote. Grab your readers' attention immediately, or after a few paragraphs they'll ask, "So what?".

Pick your audience and stick to a particular level of delivery. Unless your subject has general interest, you're wasting time trying to write for the whole spectrum of readers. If you write about a project that any Novice can build, then stay with that level. If you write a tutorial on phase shift keying, then you probably want to aim a little higher. Two things will alienate readers faster than anything else: insulting their intelligence or writing far above their level of ability.

Make your delivery in a clear, concise manner. Lists, outlines, and good photographs or diagrams always help the reader visualize the subject. Avoid asides that may distract the reader.

Let's Communicate!

You will see many fine changes on the pages of *73*, and I encourage would-be authors and long-time contributors to help us make these changes. If you have an idea for an article, please propose it in a letter with an outline. Call me on the telephone, and let's discuss your idea. I also recommend that you request a copy of our editorial calendar so you better understand our plans.

I expect you to find 1988 issues better than ever. We'll cover better construction topics but also humanize the hobby a bit more. Watch for issues focusing on satellites, digital communications, public service and education, packet, automatic control of your shack, trouble shooting, QRP, DX, antennas, propagation, and much more.

Drop me a line or give me a call. See you on the air, and hopefully in the pages of 73. ■

Say you saw it in 73!

DECEMBER 1987
Issue #327

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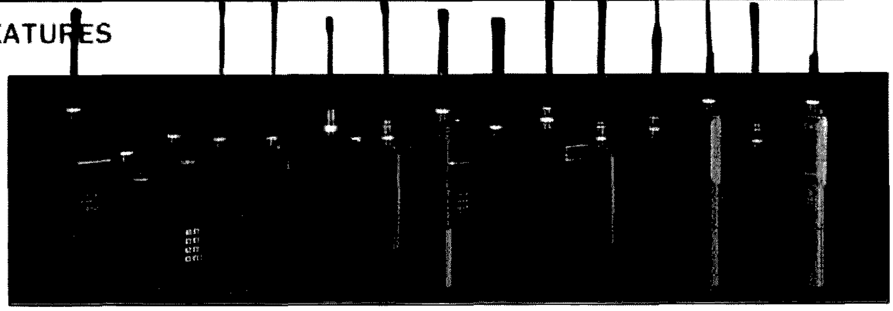

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REVIEWS

DEPARTMENTS

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Wayne Green Enterprises is a division of International Data Group.

73 Amateur Radio (ISSN 0889-5309) is published monthly by WGE Publishing, Inc., a division of Wayne Green Enterprises, Inc., WGE Center, Peterborough NH 03458-1194.

Cover Photo by Suzanne Torsheya

Welcome, Newcomers!

Welcome to Amateur Radio! Ham lingo can baffle a newcomer at first, but it doesn't have to be a real impediment. Check the glossary of terms below to help you explore this fascinating new world.

Radio Spectrum

Radio waves, heat (infrared), visible light, ultraviolet light, and x-rays are all part of the **electromagnetic spectrum**. As the term radio wave implies, radio signals oscillate up and down much like waves in the ocean. How quickly a wave moves up and down is called **frequency**, and is measured in cycles (oscillations) per second or **Hertz (Hz)**. Kilohertz (kHz) and Megahertz (MHz) refer to thousands and millions of cycles per second, respectively, and are common units of radio wave frequencies. Another measure of a radio wave is **wavelength**, which is the distance between peaks of the wave. The higher the frequency, the shorter the wavelength. Radio waves are divided in segments or **bands**. Here are a few the ham community is most interested in:

MF—Medium Frequency-300 kHz-3 MHz

This includes the AM broadcast band 535-1605 kHz and the 160-meter ham band (1800-2000 kHz).

HF—High Frequency-3-30 MHz

This segment covers the 80/75-, 40-, 20-, 18-, 15-, 12-, and 10-meter bands. This is the most popular region for worldwide DX, or long-distance operation.

VHF—Very High Frequency-30-300 MHz

Our two bands on this are 2 meters (144-148 MHz), and 1.25 meters (220-225 MHz). The two meter band is just above the FM broadcast band. **Repeaters**, stations that receive and rebroadcast signals to allow broader area coverage, are extremely popular at these frequencies. The characteristics of VHF signals mean that communications are often limited to line of sight.

UHF—Ultra-High Frequency
-300-3000 MHz

UHF communications are also limited in area coverage, and repeaters abound on the 70-cm (420-450 MHz) band. The 23-cm (1240-1300 MHz) band finds increasing use these days, but the 33-cm (902-928 MHz) band is virtually unpopulated throughout most of the country. Many hams enjoy satellite (**hamsat**) and amateur television (**ATV**) communications at these higher frequencies. Frequencies above 1000 MHz are generally called **microwave.**

Modes

Mode has many meanings, but here it is the method used to package information on a radio wave.

CW—Continuous Wave

Amateur radio's first mode of communication was continuous wave or CW, which was useful for Morse code. This wave is transmitted to produce a tone whose length can vary ("dits" and "dahs"), and shut off for spaces between tones. Morse code is still referred to by hams as CW.

AM—Amplitude Modulation

Our first voice mode.

FM—Frequency Modulation

The first hi-fidelity mode.

SSB—Single-Side Band

An AM signal has two sidebands, called Upper-Side Band, or **USB**, and Lower Side Band, or **LSB**. Both sidebands contain the same information. A clever way to save space on overcrowded frequencies is to use only one of the sidebands, but SSB equipment is more complicated than old, double sideband (DSB) AM radios. SSB development was a major advance in radio communications.

Digital Modes

Information in this mode is represented by discrete units, or ones and zeros. Read up on these in our Packet and RTTY Loop columns.

RTTY—Radio Teletype

RTTY sends characters as combinations of two tones. One tone represents ones, the other zeros. For example, the letter A is 11000, and B is 10011. RTTY is a more efficient and faster mode than CW, because tone combinations are machine-generated from keystrokes on a typewriter-like keyboard.

AMTOR—Amateur Teleprinting Over Radio

AMTOR is a special form of of RTTY that checks itself for errors that arise during transmission. It was introduced about 10 years ago.

Packet Radio

Packet is latest in amateur digital communications, and one of the most fascinating modes. Discrete "packets", or bursts, of information are sent back and forth between packet stations. Each packet contains a line of information, station to and from addresses, routing data, and error correction codes. The **protocol**, or method of coding within each packet, is also referred to as **AX.25**, an amateur implementation of a commercial system. Packet is convenient for computer-to-computer communications. Many hams set up bulletin boards (**BBS**) not unlike computer BBSs accessed on telephone lines. The radio modem that interfaces the computer with a transceiver is called a **TNC**, or Terminal Node Controller. TNCs are the radio equivalent to telephone modems. They take data from a computer, "package" it, and send it on to the transmitter.

Image Modes

These modes convey images. What follows are the three most popular in amateur radio. Look for more information on these modes in our ATV (Amateur Television) and in our Weathersats columns.

FSTV—Fast-Scan Television

This is the mode used to carry images to your TV screen. Hams have adapted this TV technology for their own needs and to see other operators that they have contact with. Color FSTV has recently become more popular.

SSTV—Slow-Scan Television

So named because it requires almost 9 seconds to scan and display an image on the CRT.

FAX—Facsimile

Similar to SSTV, except that the scan rate is much slower (1-2 lines/second).

"Q" SIGNALS

The language of amateur radio is riddled with strange three-letter words beginning with "Q"—you may have noticed that four of our monthly departments are titled with'em.
They first came into being in the code-only days to a way to reduce common questions and statements to a short code and make communications more efficient. "Q" was likely chosen as the first letter because it's the least common letter in the alphabet, and always always followed by "U"—if it was followed by anything else, it was a sure bet that it was a code.
"Q" signals can be either questions or statements. Here are the most common ones, followed by an example.:

QRL—"Are you busy? I am busy." Send this to see if a frequency is clear.

QRM—"Is my transmission interfered with? Your transmission is being interfered with." Often said "Q-R-Mary" to distinguish it from QRN.

QRN—"Are you troubled by static? I am being troubled by static." Often said "Q-R-Nancy".

QRP—"Shall I decrease power? Decrease power". There are some hams devoted to elegance of low-power operation. Mike Bryce WB8VGE devotes his QRP column to them.

QSB—"Are my signals fading? My signals are fading" Often said "Q-S-Baker". "There's a lot of QSB on the band"

QSL—"Do you copy me, do you acknowledge? I copy, I acknowledge". Hams exchange QSL cards to verify their contacts with each other. See "QSL of the Month" on page 6 for colorful and imaginative examples of these.

QSO—Conversation. "Thanks for the QSO, Old Man".

QSY—"Shall I change frequency? Change frequency." "Let's QSY up 5 kHz."

QTH—Location. "My QTH is Peterborough, NH."

QRX—"When will you call me again? I will call you at (hours) on (kHz)." Our QRX column is devoted to Amateur Radio news.

QRT—"Shall I stop sending? Stop sending." "The phone's ringing, I must QRT."

JUST PLAIN JARGON

What's a language without fun words and endearments? Following is a list of a few of ours. (Again, most descend from the CW-only days).

DX—Long Distance.

On HF this could mean contacts outside a ham's own country, but on VHF/UHF DX could be the next county.

OM—Old Man

Man of any age.

YL"Young Lady".

Unmarried woman of any age.

XYL"Ex Young Lady". Wife.

Harmonics

Children of the OM and the XYL.

88s

Hugs and kisses

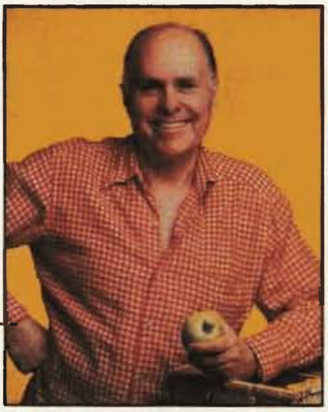
And lastly . . .

73s—

the very best to you! Enjoy our magazine!

. . .de KA1HY

NEVER SAY DIE



Wayne Green

ROSIER PROSPECTS

Things are coming together for us—we're finally heading in the right direction . . . newcomers are up. After a 10% loss in newcomers per year for several years we're seeing a turn-around. No, I don't ascribe it all to the Archie comic book.

The critical element was the recent Novice voice breakthrough—and for two reasons. Obviously the idea of being able to enjoy ham repeater communications is attractive, even restricted to 220 MHz. But perhaps an overlooked aspect of this is the impact of the new regs on ham clubs . . . who suddenly have seen an indication that the FCC admits there's an emergency.

Of course, the FCC telegraphed their concern over the gradual dying of the hobby when they tried so hard to replace the code requirement with a more difficult technical test. Many amateurs ignored the technical aspect of the proposals and whipped up emotions in less-smart hams by crying that the CBers were coming.

I'm glad that the FCC didn't give up—even if they were responding more to the commotion over the threatened ham 220 loss than any serious interest in rebuilding our aging hobby.

My goading of ham clubs to get busy recruiting Novices has been having an effect. The Novice voice rules have given them a powerful tool—and they're using it. The League has also been voicing an increased concern—another prod to get clubs moving.

We have one other force helping us—the sun. With the sun spots increasing we're getting more and more openings on our higher bands—plus more hours of action on 20m. This has increased the general ham energy level, building up spirits. It's difficult to get all excited about a hobby where the crummy bands are dead most of the time.

A Serious Increase

So we're starting to see the first serious increase in Novices in years. Will we be able to keep it up? That's largely in the hands of our clubs. If they run Novice classes and get radio clubs going in their local schools, we'll see things improving.

One more powerful factor is at work. Fred Maia W5YI, together with Gordon West WB6NOA, have put out a Novice Voice Class package—booklet and tapes. The best part of it is they've gotten Radio Shack to list it in their catalog! That could get the product where millions will see it. It sure isn't going to hurt.

I tried a few years ago to interest Radio Shack in a similar project, but they didn't see amateur radio as having any prospects for growth then. Heck, they wouldn't even test the idea just to see if it would work. Let's hope it works out and Shack will continue to carry the product.

Culture Shock

If we really do start seeing youngsters showing up on our bands we're going to have some problems. I'm not talking a generation gap—we've got a double generation gap. Most of us are about 45 years older than the newcomers, so we're going to have some problems finding things to talk about.

Heck, I find I'm having problems—and I'm the same age as the average ham today. The difference is that I've chosen not to retire, so my interests are quite different. It seems to me that about 90% of the hams I find on the air today are retired—which is logical. The few who are still working are earning a living instead of operating. So the retirees, who can ham during most of their waking hours, are who's there.

How are you going to communicate with a 13 year old? At least twenty years ago you had some teenagers around the house, so

Continued on page 12

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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Rates: in the United States and Possessions: One Year (12 issues) $24.97; Two Years (24 issues) $45.47. Elsewhere: Canada and Mexico—$39.00/1 year only, US funds. Foreign surface mail—$45.00/1 year only, US funds drawn on US bank. Foreign air mail—please inquire. To subscribe, renew or change an address: Write to Subscription Department, PO Box 931, Farmingdale NY 11737. Return postage guaranteed. For renewals and changes of address, include the address label from your most recent issue of *73*. For gift subscriptions, include your name and address as well as those of gift recipients. For questions concerning your subscription, call toll free 1-800-227-5782. To place subscription orders, please call us toll free at 1-800-722-7790 between 9 am and 4:30 pm Eastern time or write to *73*, Subscription Department, PO Box 931, Farmingdale NY 11737. ***73 Amateur Radio*** (ISSN 0745-080X) is published monthly by WGE Publishing, WGE Center, Peterborough NH 03458-1194. Second class postage paid at Peterborough NH 03458 and at additional mailing offices. Canadian second class mail registration number 9566. Microfilm Edition—University Microfilm, Ann Arbor MI 48106. **Postmaster:** Send address changes to *73 Amateur Radio*, Subscription Services, PO Box 931, Farmingdale NY 11737. Nationally distributed by International Circulation Distributors. **Contract:** The mere opening of this magazine establishes a binding legal contract between you and the publisher. Thus you are hereby directed to become a royal pain in your ham club, egging them on mercilessly to bring in youngsters and get them Noviced. Neither rain nor a sudden DXpedition surfacing on 20m shall deviate you from this course.

QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

Congrats to KA9PMK!

David Rosenman KA9PMK received the 1987 Young Ham of the Year Award at the ARRL Southwestern Division Conference in Scottsdale, Arizona, on October 10th. The 16 year old Advanced Class licensee has been on the air since age 11. The precocious young man has devoted countless hours to public event communications support and recently served as aid de camp to US Olympic Committee President Robert Hemlick. David helped translate Spanish and Portuguese during the Pan American games in Indianapolis. He also speaks Italian and French. Westlink and Yaesu USA presented David with an FT-757 HF transceiver and power supply.

430–440 MHz Threat

The possibility of hams losing this spectrum hemisphere-wide looms. Vern Riportella WA2LQQ reports that Friday, September 25th, the representatives of the Mexican government at the 1987 Mobile Radio World Administrative Radio Conference in Geneva put forth a demand to reassign the current amateur radio spectrum from 430–440 MHz to land mobile use on an expedited basis. Mexico indicated it had strong support from other Central and South American nations, and noted that even if it were turned down by the WARC body as a whole, it may unilaterally make this reallocation. The US delegation was caught off-guard by the unexpected motion and spent the weekend attempting to rally support for the measure.

Ears to You

100 sight-handicapped radio stations throughout the USA are broadcasting special news, editorials, and programs as varied as the world itself, for the sightless, and anyone else with a reading disability.

This free service is operated almost entirely by volunteer readers. Special closed-circuit receivers are also furnished at no cost.

Anyone with a visual impairment may locate the reading service nearest them by writing to: the Association of Radio Reading Services, 1133 20th St. NW, Suite 250, Washington DC 20036.

Cocos-Keeling

Starting **November 25th, 1987**, F6GVD Hans, and G3AAV Victor will be QRV from Cocos-Keeling Island for 2 weeks. No specific time or frequency is available. The first 10 minutes of the hour operators will listen for QRP stations, and at the half-hour for handicapped operators.

The calls are VK9YH Hans and VK9YV Victor. QSL via QSL Manager VK9YC or direct to F6GVD.

Running Dogs' Choice

Several new mainland Chinese stations are reported on the air. BY1CKJ says to QSL to Box 6206, Beijing, Peoples' Republic of China. Also, BY5RT gives Box 707, Fuzhou, Peoples' Republic of China, as his QSL route. Finally, BY2HIC has been heard on 14.028 MHz at 0326 with an operator named Wendy at the station controls.

GMT Dying

The six atomic clocks at Britain's oldest scientific institution, the Royal Greenwich Observatory, are running down. The observatory that gave the world GMT, marked the Prime Meridian, and became the ultimate reference point for anyone setting a precision timepiece will be forced—312 years after its inception–to ask others what time it is.

Le Bureau International de l'Heure (International Time Bureau) in Paris will become the new standard, after the Greenwich clocks tick their last.

Mobile Op Illegal?

In 1937, **the Minnesota Legislature** passed a law prohibiting radios in cars that could copy police and emergency service transmissions. It is still on the books, which means any mobile amateur in this state could be subject to arrest due to the wide frequency coverage of current rigs.

Hams organized a movement to change this law, and a bill is now working through the legislature to make it legal for hams to have that receiving ability, provided

•Convicted felons wait 10 years after their sentence expiration to use such a radio.

•Such radios must be under the direct control of licensed amateurs. No unlicensed persons can operate these rigs, even to receive.

This example can serve as a model for amateurs in states that still have such outmoded laws on the books.

Western Sahara

The Lynx group launched a joint project with the Saharan Arab Democratic Republic (R.A.S.D.) authorities two years ago with the aim to establish amateur radio in this country. The R.A.S.D., formerly the Spanish Sahara, is located on Africa's northwest coast. The project was finalized in September, and is expected to be carried out soon. They will enter the R.A.S.D. from Algeria.

Heard Is. Reheard

Dan Shaw VK3DHF/VK0HI has returned to this rare DX spot for another 6-month stint.

Aussie Novice 2m Phone?

A proposal generated at the 1987 Federal Convention to give Australian Novices phone privileges on the entire 2-meter band received full support from Federal Councillors from all divisions except VK1. Apart from providing Novices more incentive, it arose from two considerations:

•To give a common band for Australian pan-license Class communications.

•To accomodate the recent VJ/JA reciprocal licensing agreement. Japan has a long-standing amateur Telephone-only license grade with VHF operating privileges and a no-code proficiency exam. Australia still has no no-code license class.

Despite nearly unanimous support, this proposal was ignored at the Convention and so may have to wait for another year.

Miami Pope Visit

A Miami Radio Club coordinated communications for the recent visit of Pope John Paul II to that city. The Miami Archdiocese selected the Sociedad Internacional De Radio Aficionados to organize and plan the communications for the Pope's visit to Miami on September 10–11.

SIRA Prez Rafael Estevez WA4ZZG took an unpaid leave of absence from work and worked around the clock for the last four weeks to prepare for the Pope's arrival. He trained personnel and volunteers to operate 115 hand-held and 3 base station commercial radio units. Dubbed "Operation Omnidirectional," the Miami Papal network used a pair of commercial UHF repeaters, and several UHF and VHF simplex channels. Other hams and secret frequencies were in reserve for emergency situations.

Thanks to . . .

Westlink, TSRAC Bulletin, Delaware-Lehigh ARC News, W3PYF, VK3YJ, W4ATE, and VE3JPP for this month's news items. Keep'em coming to: 73 Magazine, WGE Center, 70 Rt. 202N, Peterborough, NH 03458-1194, Attn: ORX

NEVER SAY DIE

from page 6

you weren't completely out of touch. My youngest daughter is 17 now, so I have an idea of what you're up against.

Their world is school, dates, sports, rock music . . . while yours is golf, picnics, 807s and TV. Greal mix. It doesn't even help having been through the woods before, because most teenagers are convinced they know more than we do and don't want to hear about it. Kennedy and Lincoln were assassinated presidents—history. Lucy? Who's Lucy?

It's going to be difficult, and we're going to need some help. Let's not fight it because these Novices are our ticket to holding our frequencies. No matter how difficult, treat 'em right . . . make 'em welcome. Get 'em to your club and see that they have fun. There's no way you'll be able to give them too much attention. Invite 'em to your shack. If you've got a big signal, let 'em enjoy talking to some DX.

Due to the usual absurdity of government regulations you can let a pre-Novice operate your station while you are "in control"—like sitting nearby. But a Novice can only operate in the bands he's licensed to use. Great, eh? You can let 'em talk, but you have to switch. Your mother, if she isn't licensed, can operate the switch. No, don't ask me about the VOX . . . and please don't ask the FCC either. Just go ahead and shut up.

The FCC will let you do almost anything you want that isn't actually prohibited—unless you ask. Then their normal response is to prohibit it. That's the only safe move for career bureaucrats.

73 GROWTH

Let's see—outside of the hams who are mad at me for wanting to substitute a tougher technical exam for the code—those who are mad at me for wanting to increase the code speed—those who are mad at me for criticizing the ARRL—those who are furious with me for supporting ARRL—those who hate me for being pro or con on a hundred subjects—yes, outside of that majority, *73* has been growing faster than it ever has in the past. Not that many readers know where I actually stand on many things because I can argue heatedly either way—and do.

Finding younger hams for the *73* staff has been very difficult. When I first moved to Peterborough 25 years ago I had no problem in attracting a whole bunch of young college dropout hams. We had a ball, living in my 40-room old house with me cooking the meals. But with so few young hams today, there's almost no one interested in making amateur radio their career.

Well, if I can't find young hams to work in my hamshack testing new gear as it comes out, perhaps you'll lend a hand. Whenever you buy a new piece of ham gear I wish you'd check it out for a few weeks and then write and let me know what you think of it. I'm not so much interested in lab measurements as your objective experience.

Let me know how easy it was to set up and use. How are the controls? Are they easy to use? Are some missing? Are some superfluous? How about the quality of construction? If you have any problems, how's their customer service? Perhaps you've made some changes . . . what and why? If you'll let me know how the gear is working for you, I'll pass it along in *73* so we can all benefit from your good or bad experiences.

Maybe you've finally gotten active on packet and would like to tell everybody what fun you're having. I'd love to have several letters a month from readers who've tried new ham interests and are fired up about 'em.

We'll be looking for hams who can write to help us test oul new gear. No, you don't get to keep it—all you get is the fun, the fame and a few bucks to keep your wife quiet. I don't want there to be any ham gear on the market which hasn't been reviewed in *73*. Heck, I want to know as much as you do how something new works.

"How are you going to communicate with a 13 year old?"

Speaking of new, we've got my new hamshack perking. When we moved *73* from Peterborough five miles up to Hancock I had to start over. We've a nice tower and a massive Sommer antenna—driven by the ICOM 761. Now and then someone gets through to rare DX before I do, but not often. The first day I got it on the air I worked five HLs for the Worked All Seoul certificate (WAS). What a delight to call someone and know he's going to come back.

There's no way I can put in the hamming hours I'd like, not with five other publications—plus some other small businesses. So I need help in getting my hamshack set up for OSCAR, active on packet, more functions on my repeater, and so on. Find ham help today? It isn't easy. I'd love to hear from anyone who might be interested.

ASPEN HAMFESTETTE

You a skier? Doing anything special in January? If I've got a yes-no on that pair, there's a group of us who get out to Colorado the second week of January most every year and burn up the slopes and the Aspen repeater, HTs in hand.

This got started as a small ham industry meeting back in 1976 providing a medium for a few manufacturers and dealers to get together to talk about hobby and industry problems. Local and vacationing hams joined in, so now it's just a general ham skiing week in Aspen.

We not only have a ball on the slopes, the apres-ski is fun, too, with group dinners at different restaurants every night.

For some reason the second week of January usually finds Aspen almost deserted, so there are no lift lines and no problems getting seats in restaurants. Let me know if you think you can make it. Yes, there'll be some wives . . . and the skiing skills range goes from bunny to gung-ho. I'm a fast intermediate, but slowing down as my old bones get brittler. ■

73 Review

by Marc Stern N1BLH

Kenwood USA, Corp.
2201 E. Dominguez St.
Long Beach CA 90801
Price: $323

Kenwood TH-215 Handheld

High-Class Hand-Held Hamming

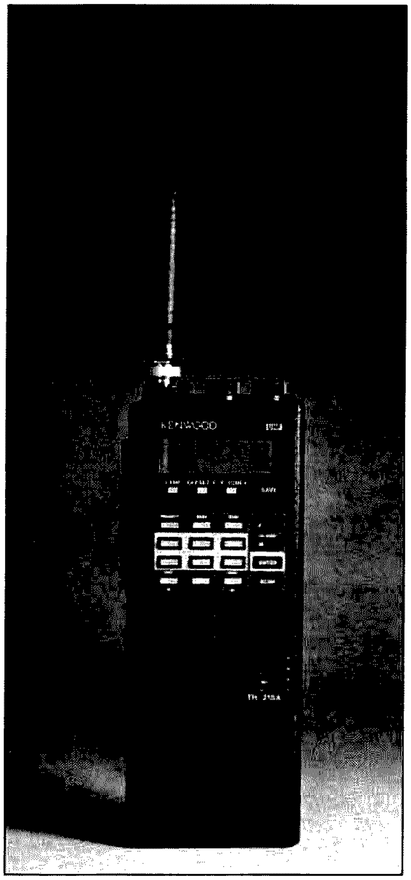


Photo A. The Kenwood TH 215A Handheld.

No matter how many times you look at or think about today's equipment, one fact becomes clear: It's amazing how much manufacturers are cramming into smaller and smaller spaces. For example, the Kenwood TH-215A two-meter transceiver packs a lot more wallop than the handheld it replaced (the 2600) more than a year ago—in a package that's the same size. In fact, the TH-215A corrects many of the things that I find somewhat troublesome on my own TR-2600A.

Great Stuff!

Take the squelch, for instance. On the TR-2600A, Kenwood combined the squelch and volume controls into one position, rather than two. The manufacturer did this by using concentric controls, one shorter than the other. The only problem is that many times when you turn off the 2600, you open the squelch and that can be a shock when you're not expecting it. On the 215, the squelch and volume controls are in two positions, as they were on the older Kenwood TR-2500A, which preceded both the 2600A and 215A.

Another area that Kenwood improved upon is the liquid crystal display. On the 2600A, it is small but usable, and there is really no easily distinguishable way to determine the mode your rig is in—carrier-operated squelch for scan or priority mode, for example. Yes, there are indicators in the display, but they are small (a C for carrier-operated squelch) and easy to miss in the display. On the 215A, the display shows not only if the rig is in priority, but there is also a clear indication of the rig's mode in an easily visible grid at the bottom of the display.

Another interesting feature of the 215A is its multiple tone capability. Instead of registering command entry into the microprocessor-controlled handheld with simple tones as was the case on the 2600A, you now have a range of tones which indicate an action has taken place. Each action seems to have a different sequence of tones, which is a good reinforcement if you have doubts that the action you wanted really happened.

Still another improvement is the scan rate. Like the 2600A, the TH-215A has 10 memories and offsets are stored for each memory, as well as any subaudible tone which may be needed. On the 2600A, there was no built-in range of subaudible tones. Instead, you had to buy a separate module to activate any tones. It's a nice improvement and should be welcomed by those operators who need this feature.

Another improvement for those who like to monitor many repeaters is a higher-speed scan rate for the 215A. Where the 2600A improved on the older 2500, the 215A rockets past the 2600A. The scan rate seems on the order of about 8 to 10 memories a second, which means that you'll seldom miss a conversation, unless you have the carrier-operated squelch feature activated. If the carrier-operated scan feature is activated, then you'll find the rig stays with one QSO until it's over and then moves on when the tail drops.

The List Goes On

The list of improvements goes on and on, but here's a look at some of the other key changes: signal strength meter is now part of the LCD, rather than at the top of the rig as on the 2600A; the keypad is smaller and uses soft-feel rubber keys which should last for a while; the reverse switch is on the front of the rig instead of the top; the offset switch is also on the front, instead of the top, and the enter key is plainly labeled. Also, the keyboard lock and transmit lock functions are no longer separate and on the side of the rig where it's easy to forget them. Instead, they are on the keypad, too.

With the number of functions that have been included on the front of the rig and with the ease of access, it's quite evident that Kenwood is finally realizing that many handhelds are used in place of mobile rigs, especially when you consider that most handhelds are now capable of three to five watts of output.

The TH-215A falls into the five-watt category. Using a lightweight metal (magnesium, probably) rear case as the heatsink, the TH-215A is capable of five watts of output when 13.8 VDC is applied to the rig.

Another feature surely everyone will like is the 215A's extended receive capbility. It receives from about 141 to 163 MHz, which makes this rig useful for those people who want to listen to public service frequencies or the National Oceanic and Atmospheric Administration's broadcasts in the 162 MHz range. Of course, this is also a bow to competitive pressures because other rigs have had this feature for a long time.

Some other interesting features of this rig include the ability to store odd offsets in memory 10; a battery saver which extended battery life; a tone squelch setting which works in conjunction with the built-in tones capability; memory lockout to skip over unwanted frequencies, and the multifunctional display.

This package also comes with some good specifications. For example, it has three output levels, about 200 mA on low power, 2.5 watts on high power with the battery, and five watts with 13.8 Vdc; maximum deviation is preset at the factory at 5 kHz; sensitivity of less than 0.2 uV; squelch sensitivity of 0.16 uV; selectivity of more than 12 kHz at -6 dB and less than 24 kHz at -40 dB, and 350 mW of audio, which is more than adequate in most situations.

Swapping Accessories

If you are in the market for this rig be aware of several things. First, unlike other, older handheld series that Kenwood has manufactured, the TH-215A has nothing in common with its predecessors. For example, I can use 2500A accessories with the 2600A and vice versa. But, I can't use anything more than the speaker-microphone of the 2600A with the TH-215A.

Also, the batteries have changed with Kenwood opting for the Motorola style twist on battery. So, where some people may have had problems with rails breaking on the older plastic battery cases, especially when the battery dropped, it is likely other people will have

problems with the two plastic retaining tabs which extended from the base of the TH-215A. This is only a observation, rather than an empirical result from prolonged testing. It is more than likely that people will use this rig for years with no problem.

If you plan to use the five-watt capability when you're driving, be aware that the metal case becomes quite hot to the touch and if you lay it on plastic, it is conceivable you may mar the plastic with the rig. Be sure to keep it so that air circulates freely around the handheld.

Finally, where Kenwood's documentation used to have a few problems, the instruction manual they send with the TH-215A is barely understandable and other than providing a semblance of an idea of what each function does and how to do it, you can probably figure out each function yourself about as quickly. It also omits certain things, evidently assuming that hams are little more than appliance operators. One of the key items that is missing is how to wire up a speaker-microphone or headset of your own. It's nowhere to be found, although you are told how to wire up the 13.8 VDC plug.

Overall, the Kenwood TH-215A is a worthy replacement for the 2600A. It's worth a look and, in fact, if I was in the market for a handheld today, I'd probably opt for this one.

Number 13 on your Feedback card

The Kenwood TH-205AT Two-Meter Handheld

by Larry Ledlow, Jr. NA5E

Kenwood USA Corp.
2201 E. Dominguez St.
Long Beach CA 90810
Price: $260

Good Heavens! Good Value!

These days hams shopping for a handheld FM transceiver face some difficult choices. The TH-205AT/A/E models are Kenwood's answer to shoppers looking for a functional two-meter rig without a lot of complicated or expensive features they don't intend to use. Kenwood introduced the TH-205 and its 70cm sister TH-405 to satisfy those frugal hams who want good value in a hand-held radio.

A Nice Package

The TH-205 is a standard-sized handheld. The transceiver module (without the battery pack) matches the dimensions of an ICOM IC-2AT. The supplied PB-2 makes the Kenwood about ½ inch taller than the IC-2AT with its standard BP-3 battery pack. Specifically, the TH-205 measures 2 ¾" x 7 ⅛" x 1 ½" and weighs approximately 19 ounces with the NiCd battery pack and antenna. Fashion-conscious hams will no doubt rejoice to find the rig's tasteful black and gray color scheme matches most any shack accessory. This attractive package features two watts output with the supplied PB-2 and five watts output with the PB-1 battery pack. The USA version also comes with a DC cable to operate from any 13.8-volt source to get 5 watts output. Low power output is approximately 500 milliwatts.

The suffix AT designates the model equipped with a 16-button DTMF keypad. Other features and controls common to both TH-205 and TH-405 radios include up/down tuning keys; three memory buttons; scan, offset select (±/simplex), and display lamp keys; frequency lock switch; and a multipurpose LCD readout with frequency, offset, battery status, ON AIR, and channel BUSY indicators. The rig accepts 7.2–16 VDC in a receptacle adjacent to the BNC antenna connector. It also has receptacles for an external speaker and a microphone. The TONE switch atop the rig activates a subaudible tone encoder. Selective hams who won't let just anyone break their squelch will find the optional TSU-3 CTCSS tone squelch unit absolutely essential. The TSU-3 prevents the squelch opening unless the received signal contains the appropriate tone.

On the Air

Off the shelf, the TH-205AT receives from 141.000 to 162.995 MHz and transmits from 142.000 to 148.995 MHz. The user tunes frequencies with the up/down buttons in 5-kHz steps. Depressing the tune buttons for longer than a second will cause the unit to tune quickly, somewhat greater than 3 MHz per minute. The fastest frequency change strategy is to select the memory channel nearest the desired operating frequency followed by fast tuning from the keyboard. The repeater offset is fixed at ± 600 kHz.

Reactance modulation produces the frequency deviation for the transceiver. Several hours of on-the-air tests proved the rig worked well with favorable reports of transmitted signal quality. Audio quality from the small speaker is average and unsurprising, since the output is approximately 350 milliwatts across 8 ohms and with 10% distortion. Noisy environments would require an external speaker or headset. All handhelds suffer from this deficiency.

The final power amplifier unit uses the back panel of the rig as a heat sink. This panel becomes noticeably warm after even short contacts. The operating manual carries a worrisome warning to keep the back panel away from plastic or vinyl surfaces when operating in the 5-watt mode for long periods. Installation of the metallic belt loop on the back panel should help dissipate the heat more efficiently.

Kenwood rates the supplied PB-2 at 8.4 volts and 500 mAh. This gives the user about an hour operating time in the high power mode. This rating assumes a duty cycle of one minute transmissions followed by three minutes reception. As usual, the NiCd pack gives very little warning of impending depletion, and the BATT warning indicator on the LCD serves a useful purpose. The TH-205 uses a battery saver function, which turns a number of functions off after one minute idle time. The receiver reactivates when it detects a signal. Lithium batteries maintain memory and VFO settings while changing battery packs.

The three memories retain frequency and offset information. Two keystrokes enter a frequency into memory from the main VFO, and one keystroke recalls the memory information. The memory recall buttons actually toggle between the selected memory and the previous selection, whether it was the main VFO or another memory.

The user initiates scanning on the TH-205 by depressing the SCAN button. Only full-band scanning is available, and pressing an up/down tune button determines the direction of scan. The scan stops on a busy channel and does not resume until the user presses the scan button again. The scan rate is slightly less than the fast tune rate. I measured 2.9 MHz per minute. The radio will not scan its memories.

Several other features are worth noting. A MONITOR button above the PTT switch temporarily opens the squelch and allows the user to quickly check the channel for activity. This prevents fumbling with the squelch level setting to check for weak signals. The DTMF saves a little work, too. The rig will remain in transmit mode for two seconds after the PTT and first DTMF button are depressed. Each subsequent press of a DTMF key also activates the transmitter for two seconds. Therefore, the user can release the PTT and complete the dialing with very little hand coordination. Users with certain physical handicaps may really appreciate these features.

A Winner!

The TH-205AT represents good value. In today's ham market, all hand-held FM transceivers command respectable prices. Price-conscious operators who are looking for a basic HT will find the TH-205AT more than adequate. Although a simple rig, the TH-205 offers a few nice features without adding a few hundred dollars to its price. Kenwood has a winner here.

TH-205AT Specifications

Frequency Coverage:	141.000–162.995 MHz RX	Receiver:	Double-conversion superheterodyne
	142.000–148.995 MHz TX		30.825 MHz first IF
Power Requirements:	6.3–15 VDC Battery Pack		455 kHz second IF
	7.2–16 VDC External DC		
Power Output:	5 watts (with PB-1 or external DC)	Sensitivity:	Less than 0.25 µV for 12 dB SINAD
	2 watts (with standard PB-2)		
	500 mW (low power)	Selectivity:	More than 12 kHz at -6 dB
			Less than 28 kHz at -40 dB

Number 14 on your Feedback card

73 Review

by Bryan Hastings KA1HY

Alinco ALX-2T 2-Meter Handheld

Small and Simple

Alinco Electronics, Inc.
20705 S. Western Ave., Suite 104
Torrance CA 90501
Price Class: $250 (AC Charger, DC drop-in Charger, Tone Board, and EBP-3N 450-mAh Battery Pack)

Hand-helds—amateur personal communication devices—have quickly evolved in the past 10 years, and the obvious trend was to make them smaller and pack more features in them. HTs became so over-featured, however, that soon hams demanded one with fewer frills and made easier to operate. The ALX-series HTs from Alinco, their first mini line, are such rigs.

They have been on the market only since mid-October. I spotted the 2-m prototype down at the Atlanta Hamvention in July, and 220- and 440-MHz versions are also on the market. At the time I received the 2T for review, the tone boards weren't yet available.

ALX Features

The features are *basic*. The frequency is thumbwheel-set on the top panel of the rig, with three thumbwheels for the 1-MHz, 100-kHz, and 10-kHz digits. The 5-kHz offset is set with a pushbutton, also located on the top panel. You cannot set a non-standard offset frequency.

The on/off/volume switch is adjustable, but the squelch isn't. A three-contact jack for an external mike and speaker is between the volume and squelch. To open the squelch, press its button on the top panel and keep it pressed for as long as you want it open. There is a similar switch for the lamp, which glows soft green and changes to red in the transmit mode. There is only *one* memory.

The only "scan"feature is the priority switch, which allows the unit to monitor the alternate channel. There is a pushbutton on the top panel for dial and memory mode, and one for encoding a 1750-Hz tone. This tone is found only on the European version (2E) of this HT, since many European repeaters require this tone for access. The memory channel has its own 5-kHz offset switch, but the dial and memory channels share the single repeater offset control.

The keyboard on the front panel has only the numeric keys and the star and hatch, for autopatching. The DTMF tones are not user-audible.

The transceiver also has a battery-save function, set by a slide switch on the front panel. Battery save lowers receive-mode current to a third of the normal setting. You can set the rig to battery save-high power, battery save-low power, or high power without the save.

Operating Impressions

I had no trouble assembling the rig except for a sticky battery pack. The antenna connectors are unusual. They are threaded and resemble RCA phone connectors. The audio is acceptable.

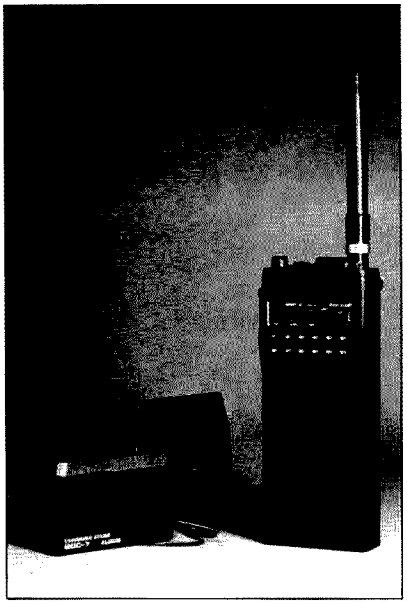
ALX-2T Specifications

GENERAL		
Frequency Range	144–147.995 MHz (2T)	
Operating Temperature	−10°C to +60°C	
Power Supply	Receive Requirement	
	Batt. Save ON	25 mA
	Batt. Save OFF	8 mA
	Transmit	
	High (2 W)	750 mA
	Low (400 mW)	350 mW
Dimensions	58 (W) x 141 (W) x 23 (D) mm	
(including projections)	66 (W) x 151 (H) x 28 (D) mm	
Weight	240 g	
TX Section		
Power Out	2.0 W/400 mW (7.2 V)	
Modulation System	Reactance Modulation	
Max. Freq. Deviation	±5 kHz	
Unwanted Reflection	Less than −60 dB	
RX Section		
Sensitivity	12 dB SINAD, less than 0.25 μV	
	S/N more than 26 dB at 0.5 μV input	
Squelch Sensitivity	Less than 0.25μV	
Selectivity	More than ±7.5 kHz at −6 dB	
	Less than ±15 kHz at −60 dB	
AF Output	More than 200 mW (8Ω load, 10% distortion)	

Its big advantage is portability. I reviewed the rig with the 450-mAh battery pack (EBP-3N), which weighs only 12 ounces and has dimensions very close to the ICOM μ2-AT. With the smallest pack, the 2N, total unit weight is only 9½ ounces, putting it under the Kenwood minis in size and weight.

Now for the disadvantages. Bear in mind that these are *ergonomic* comments only, and don't reflect on the electronic integrity of the rig. Some operators may not even see them as problems.

The biggest drawback is the difficult-to-dial single memory channel. It's set with three recessed dials on the front panel that correspond to the 1-MHz, 100-kHz, and 10-kHz digits, and



The Alinco ALX-2T with charging stand and AC adaptor.

require a flat-edge blade, similar to that on a jeweller's screwdriver, to adjust. You are also required to carry this special tool, though Alinco provides it on the carrying strap. These controls are stiff, and in the half-dozen times that I reset the memory frequency, the soft plastic around the dial groove began to wear a bit.

The priority function samples the alternate channel at three-second intervals and emits a tone when the alternate channel is busy. Its two distractions are the raspy screech of this tone, and the stuttering effect due to the selected channel audio dropping out during the sampling cycle. This stuttering is a feature common to most rigs with priority channel scanning.

The thumbwheels for dialing the main channel require nimble fingers. They are flanked from the top by the protruding dial lamp, on the right by the antenna connector, and on the bottom by a small protrusion. It can be difficult to crank the wheels toward the lamp. In the same vein, the keypad keys are also very small, not widely spaced, and have modest detent.

Accessories

There are four battery packs available, which permit power outputs from two to four watts and from 30 to 90 minutes of operation time. This HT came with the 450-mHa battery pack, and a charging stand that accepts either 110 VAC or 12 VDC with the AC and cigarette-lighter adaptors.

Conclusions

Bear in mind your particular circumstances when considering this rig. Are you looking for a pocket-sized rig to satisfy your basic communications needs? This rig is one of the lowest priced units available. The ALX-2T, one of the smallest and lightest HTs on the market, is a big contender in today's heavyweight HT market.

Number 1 on your Feedback card

Pete Putman KT2B
353 Fieldstone Dr.
Doylestown PA 18901

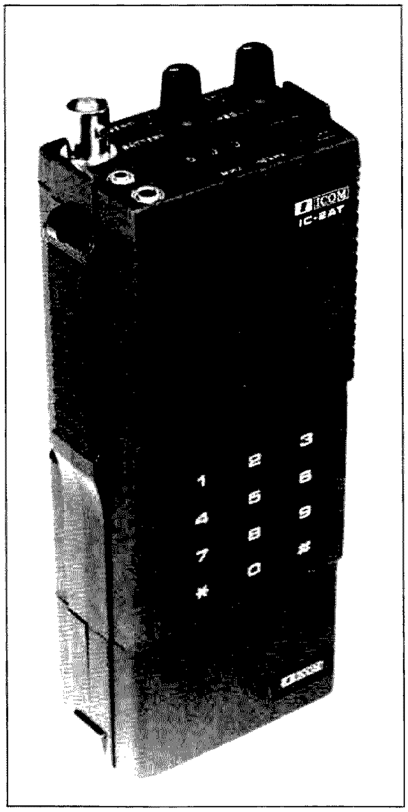
ICOM's Classic IC-2AT: The Most Popular Hand-Held of All Time

The IC-2AT has left an indelible mark on the amateur radio world since 1979.

"Step right up, folks. Don't be shy! Look at this little beauty. I'm telling you, it's a marvel of construction, full of features and easy to use. Small enough to fit in your pocket, too. Best of all, it costs only two hundred thirty dollars. At that price, you'll want two of 'em! Hurry...hurry." Snake oil? Nope. Just amateur radio's equivalent to the Model T: The ICOM IC-2AT hand-held, perhaps the most popular and enduring transceiver of all time.

Since it burst onto the scene in December, 1979, over 500,000 units have been sold world-wide according to ICOM America. It's been manufactured in several versions depending on the country of destination, and has spawned a wealth of aftermarket accessories ranging from quick-charge adapters to drop-in mobile docking boosters. The IC-2AT also single-handedly created a strong market for hand-held amplifiers, typically running 25-35 watts output for 1-2 watts drive.

73 readers first found out about this little marvel in the May, 1980, issue which featured a full-page advertisement with a life-size photograph. The copy read, "When Is ICOM Coming Out With a Hand-Held?" and below the transceiver was the reply: "The Answer Is: Now!". This sent thousands of hams to their phones, charge cards clutched in one hand while dialing with the other. Initial orders overwhelmed dealers! The IC-2AT pioneered a number of features commonly found on HTs today. It was the world's first synthesized hand-held to use both thumbwheel encoding and detachable battery packs. It also offered a range of these packs for various charge rates and output power levels. This approach kept down-time to an absolute minimum. Other hand-helds on the market couldn't be used while charging. ICOM also forced the rest of the industry to standardize BNC antenna connectors.



ICOM's IC-2AT

Frequent visitors to hamfests will remember a long period in the early '80s when hamfest organizers didn't have to advertise the door prize: an IC-2AT, of course. Many lucky winners went home with a second unit to back up their initial purchase of this HT. Some wound up with three and even four! In one case, the winner actually refused the prize and negotiated to get the second prize (an antenna tuner). Failing that, he accepted and turned the 2AT into ready cash at a bargain price, which he then spent on the desired tuner. When asked why, he replied "I sure don't need four 2-meter hand-helds."

The First Runners

The first modifications for IC2A/2AT series radios made their appearance in the July, 1981, issue of *73*, and (wouldn't you know it) they detailed the installation of a non-standard offset, using an extra CD4051 IC and a few crystals to do the trick. ICOM by this time had announced 10 accessories for the line, including 5 different battery packs. VoCom had come out with a neat little 2-meter amplifier that produced 30 watts with as little as 200 MW of drive—perfect for IC-2AT mobiling. A number of small enterprises introduced battery eliminators for use in the car or base station, perhaps fueled at the time by a shortage of the official ICOM factory version. Subsequently, an article in the August, 1981, issue of *73* detailed a way to roll your own accessories for the IC-2AT, specifically a PTT microphone, trickle charger and the use of a K-Mart 110 camera case to protect the hand-held.

By this time, both Yaesu and Kenwood were into their second generation of synthesized hand-helds, and Santec had jumped into the market to compete with ICOM. No problem, as ICOM stole the march on everyone by announcing the IC-3AT for 220 MHz

in December, 1981, and promptly sent every 220 enthusiast running to the phone with credit card clutched in one hand as they frantically dialed with the other. More companies came out with accessory amplifiers and 5/8 wave base-loaded antennas as the hand-held market in general was heating up.

For most purchasers, the IC-2AT (or -2A, without the DTMF option) became an indispensable companion rivalling the family dog. IC-2ATs went to plane flights, ocean cruises, family outings, in hot air balloons, hiking, camping, skiing and bicycling. For the travelling ham, the rig proved indispensable.

One climber took an IC-2AT up Mt. McKinley to communicate with a base station many miles distant. Scott Nelson, W7KUF, told this dramatic tale in the January, 1982, of *73* and detailed the climb of North America's highest peak with members of his Snowbird Expedition. He chose the IC-2AT because it was small, easy to use and didn't drain the batteries to operate such things as a display and other bells and whistles. His choice paid off during a very real emergency on the climb: The IC-2AT was pressed into service to request an airlift for an injured climber.

In May, 1982, ICOM advertised the IC-4AT, sending the usual 440 MHz FM enthusiasts flying to the telephones clutching credit cards. More modifications had appeared by this time, including several conversions to MARS and CAP frequencies. Other manufacturers lowered their prices to compete with the IC-2AT, which hovered about the $230 range but could be had for closer to $210 with judicious shopping.

The years followed with innumerable modifications to batteries, frequency coverage, DC supplies and all kinds of wacko portable antenna designs for portable use. Other manufacturers continued to evolve new generations of hand-helds (and many of them adopted the slide-on battery pack system pioneered by ICOM) with more bells and whistles than ever before. The IC-2AT? It continued to sell at a steady pace, as did the IC-3AT and -4AT versions. But pressure was building on ICOM to come up with a comparable whiz-bang answer to their competitors.

"The IC-2AT became an indispensable companion rivalling the family dog."

Updating a Standard

So the answer came in 1984, with the IC-02AT and IC-04AT series radios, with scanning, memory storage and a backlit LCD display. Additional accessories were introduced, among them a VOX headset and a high-current battery pack. Many of the new accessories were interchangeable with the older IC-2AT/3AT/4AT series, however. ICOM had no intention of replacing the Volkswagen Beetle of HTs!

Today, eight years after the unit's introduction, the picture is pretty much the same. The product line has added 23 cm in the form of the IC-12AT, but the IC-2AT continues to chug along, albeit at a somewhat higher price. And it can't claim to be the most popular grand prize at hamfests anymore (to the relief of owners with 7 or 8 units).

And the survival tales are still told of the legendary endurance of the tough case and innards: drops from 70-foot towers; dives into a pool, retrieval, drying in an oven and springing back to life; flights out of a car window or door at 30 mph, hitting the ground and squawking back to life with a new battery pack. I can personally testify to the ruggedness of the IC-2AT. After a fall and slide down a ski slope for 100 feet on top of one, buried about a foot under the snow, I resecured the battery pack, switched it on and heard a nearby repeater—as if nothing had happened.

Yes, the IC-2AT has certainly left its mark on the amateur radio world over the past few years and will continue as an industry standard. 73

Larry R. Antonuk WB9RRT
Technical Editor

ICOM BP-4 Charging Adapter

Our own technical editor beats the system.

Practically every ham radio operator, and certainly everyone involved with electronics, has at one time or another experienced a feeling of absolute despair. The despair usually occurs right after the project you just built fails to work, or when that puff of creamy smoke comes out of your month-old rig, or as you watch your new tribander slowly drive itself through the garage roof. The feeling usually is a combination of extreme frustration, confusion, and sadness, followed by the realization that there really is no governing force in the universe. Physical symptoms that accompany these feelings include long sighs, drooping shoulders, poor posture, and a knot in the abdominal region.

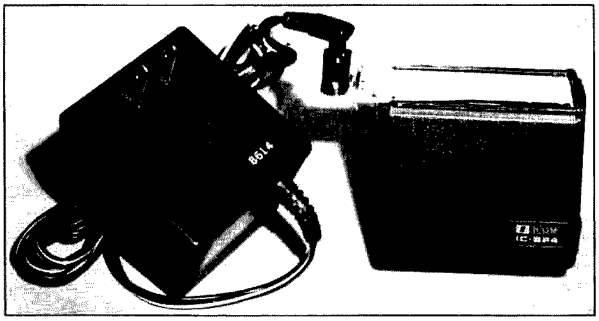


Photo A. The WB9RRT el-cheapo IC-BP4 charger adapter, inserted under the rails of the battery pack. See Figure 1 for foil layout on board bottom.

A Serious Deficiency

Not having experienced any of the above situations recently, I had been feeling quite immune to any feelings of hopelessness. This all changed with the purchase of a simple battery pack for my IC-2AT. My original battery pack was getting a little weak, and I knew it was time for a replacement. After pricing new battery packs, it occurred to me that I could buy the empty BP-4 pack, fill it with slightly used NiCds that I could get for free at work, and have a perfectly good battery—all for only $15.25. I bought the BP-4 pack at the next hamfest.

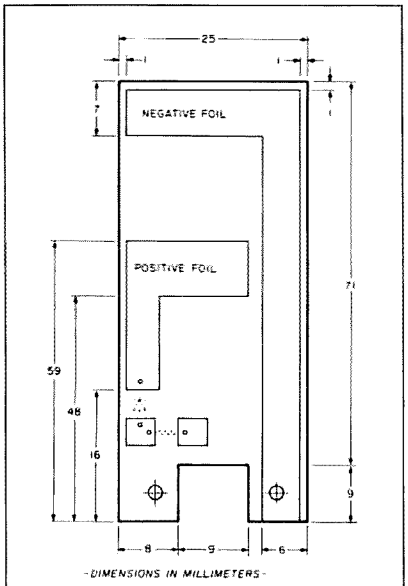


Fig. 1. PC board dimensions. The two small foil pads provide mounting points for CR1 and R1. Their dimensions are not critical.

A few days later I brought home some NiCds, secure in the knowledge that I was advancing ham ingenuity and outsmarting ICOM. I disassembled the pack, popped in the batteries, and screwed it back together. I plugged in the wall charger and stood there, my power plug in my right hand, my new cheap battery in my left, when I made this discovery—there was no hole on the BP-4 for the power plug! I turned the battery over seven or eight times, searching for the jack. There was none. It turns out that the battery pack with the unreplaceable NiCds has the charging jack, but the pack for the replaceables doesn't! I had just spent $15.25 on something that I couldn't use unless I spent another $74.50 for the proper charger. (Please see paragraph one.) So much for saving money.

I realized that I could simply cobble some jumper clips onto the two contacts on the bottom of the pack, hook them to a current-limited supply, and charge the battery. This was OK, but every once in a while I slammed the door too hard on the way out of the shack and the jumper clip would jump off (no doubt that's why they call them that). I'd come back sixteen hours later to a completely uncharged battery. I toyed with the idea of converting an old HT-200 charger, but I knew that I'd get *that* project done sometime in 1998. I needed a quick-and-dirty yet reliable setup to charge my battery.

Eureka!

The final result can be seen in Photo A. The adapter allows the regular wall charger power plug to be plugged into the BP-4 battery pack, charging through the output terminals. The small amount of circuitry on the board imitates the circuit found inside the standard pack. The adaptor slides onto the top of the battery, under the lips that normally hold the radio and battery together. It provides a solid means of providing contact to the ± terminals, and can be built in about thirty minutes.

Construction of the adapter is quite simple, but it is critical in two areas. The printed circuit board used must be quite flexible, since it needs to bend slightly in order to be slid into the pack. Common dime-a-dozen hamfest boards work quite well. An alternate method is to use a piece of stiff plastic material, and cement brass stock to it. The other critical spot concerns the 1mm gap around the outside of the board. This prevents the traces from touching the ± terminals at the same time while the adaptor slides in and out. Failure to include the gap on your board would cause a momentary short circuit each time the adaptor was used, which your battery doesn't like. If the phone rang while the adaptor was exactly half way out, you'd return to a pile of smoking plastic. Don't forget the gaps.

You can etch the board, but the "X-acto-Knife-Cut-and-Peel" method works fine. I cut the side gaps with a file, running diagonally across the edge of the board. The notch at the bottom of the board was cut in with a nibbling tool, but a file and some patience work just as well.

The BP-4 adapter is certainly not a high-tech device. Until you get around to building that Multi-Voltage/Digital Readout/Auto Cycling/Drop-In battery charger, however, it isa quick, cheap, reliable method for charging "jackless" ICOM batteries. ■

Parts List

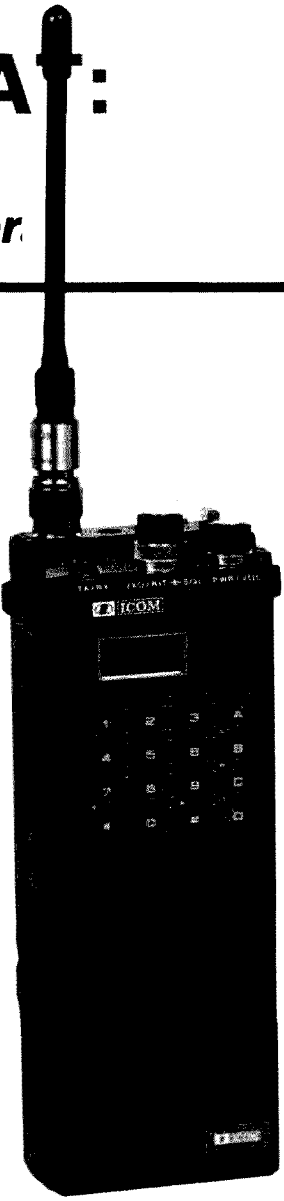
CR1	*IN914, IN4148 Diode*
R1	*82 Ω ½ W Resistor*
J1	*Coaxial Power Jack (RS #274-1565)*
	Thin, Flexible PC Board Material

73 Review

by Pete Putman KT2B

ICOM IC-12AT:
The Exotic 23-cm Hand-held Transceiver

ICOM America, Inc
2380–116th Ave. NE
Bellevue WA 98004
Price Class: $460



The ICOM IC-12AT 23cm FM hand-held transceiver.

FIRST 1.2-GHz HAND-HELD

We've graduated from watching Captain Kirk and Mr. Spock with nifty pocket communicators to the real thing. . .a portable, 1-watt FM transceiver for 23 centimeters, courtesy of ICOM. It's not quite as small as those legendary communicators, but it has a lot more features and doesn't depend on dilithium crystals for its energy source.

Plenty of Features

The IC-12AT does make a compact package, slightly larger than the IC-02AT/03AT/04AT series radios at 6 ½" H x 2 ½" W x 1 ½" D. With the supplied BP-3 battery case, this great little handheld makes for an easy tote at just over one pound.

The output power is rated at 1 Watt and 100 mW on high and low power settings, respectively. This should mean quite a long period between charges except that the current consumption is rated at nearly 900 milliamperes in the high-power position. With the standard battery voltage of 8.4 volts, that means that the IC-12AT uses nearly 7.5 watts battery power to generate that 1 Watt output as well as run everything else on board. This rig draws 400 milliamps in the low power position, meaning 3.3 Watts of power are consumed to generate 100 mW output. Solid state microwave circuits tend to be rather inefficient. The batteries are dead after several hours of average-duty operation on high power. The transceiver also connects directly to a 13.8-volt power source to eliminate the battery pack altogether. The battery pack will even charge while connected to this jack.

The IC-12AT accepts all of the accessories of the IC-0X series handhelds. Users familiar with with other radios in this series will find many familiar functions, including subaudible tone selection and activation, DTMF signalling, memory scan, programmed band scan, and priority channel mode. The IC-12AT features two new controls essential to 23 cm operation: RIT (Receive Incremental Tuning) and VXO (Variable Transmit Offset). The former shifts the receive frequency up or down by 5 kHz from the display, while the latter shifts both.

The antenna will surprise some folks. It's a flexible vertical that attaches via a TNC connector (as opposed to the more conventional BNC connector), and I wonder why ICOM made the switch. After all, BNC connectors work at this frequency without any appreciable insertion loss. Further, a BNC would allow easier connections to an external antenna or an outboard amplifier using low-loss cable. Besides, most hams are unfamiliar with the TNC.

"The IC-12AT accepts all of the accessories of the IC-0X series."

The Inside Story

Internally, the IC-12AT has a few neat features. For one, the output stage is a power module instead of a discrete device—supposedly a first in hand-helds (according to the literature). The receiver is a dual-conversion design with no less than 3 bandpass filters before the 1st mixer to reduce spurious IMD products. A bonafide antenna relay is also employed instead of diode switching (this would account for some of the additional current consumption).

The receiver scheme has the first i-f at 59.55 MHz and the second i-f at 455 kHz. In fact, the second LO, i-f amplifier, mixer, FM detector, and noise amplifier are all on one IC (similar to the Plessey designs of some years ago). Although not unusual, it saves a lot of space, which is at a premium! The transmitter uses six stages to get to the final output power.

A Performance Test

Now for the burning question: How well does this rig work? After all, the 23 centimeter band presents a new challenge for hams familiar with 2 meters and 70 centimeters. A number of tests would determine the unobstructed maximum usable path, as well as the range through a fair amount of obstructions—such as a stretch of woods. A cleared field about 1/2 mile in length and nearby woods provided a suitable test environment for two IC-12ATs.

Both high and low power settings easily yielded clear communications over the length of the field. The effects of multipath from nearby objects were minimal. Trees noticeably attenuated the signal, and communications were completely lost after about 1/2 mile of separation through the woods of mountain laurel and pine.

During this test the more pronounced effects of multipath reflections and refractions became apparent. By remaining stationary and moving the IC-12AT through an arc of 90 degrees, 5 feet above the ground, no fewer than 20 peaks and nulls appeared in

that arc! Obviously, trees cause a problem with 23 cm.

A fairly unobstructed view of a nearby 23 cm repeater should prove a useful operational environment. The only consideration might be path loss, which in dry air at this frequency could allow about 2.5–3 miles (assuming a free-space attenuation figure of 4 dB/mile in clear air). Thus, if the handheld presented a full-quieting signal adjacent to the repeater, it might be 10 dB noisier at that distance. Remember that this only applies to dry air! Smog, haze, and moisture droplets will significantly increase the path loss, so much so that you might not be heard at all several miles away in heavy rain.

Consider another scenario: The Dayton Hamvention. Thousands of handhelds there transmit on frequencies from 50 to 450 MHz. A move to 23 cm with a set of IC-12ATs would avoid the crowd and the accompanying intermodulation problems. But what about reliable communications throughout the show grounds, both inside and out? Point-to-point communications in the flea market area should be easy. From the flea market to deep inside the arena contacts may prove difficult.

Radio wave reflection and refraction become apparent at microwave frequencies with surprising results. Some users of UHF hand-held radios claim performance is markedly better than at VHF in crowded environments like the inside of an office building. Remember that a lot of people cast clouds of doubt on the utility of mobile bands above 800 MHz, and look at the growth of users up there today. The bottom line is that propagation at 23 cm is different from the more commonly used ham bands, and it holds plenty of surprises for those willing to experiment.

Conclusion

Yes, the IC-12AT is exotic, all right, but fully functional. Its fairly sensitive receiver and respectable output power will allow efficient communications over a limited range. It is easy to set up and use, although battery consumption is very high. The supplied TNC antenna connector makes quick connections to other antennas and amplifiers somewhat inconvenient.

The rig holds plenty of potential for those who want to get away from the crowds on the lower bands. Experimenters should find plenty of exciting ideas to try out, especially with compact, high gain antennas. How about a vertical dipole driven element with a screen reflector? I'd like to see one of those out at Dayton in '88. And should we eventually launch an amateur satellite with 23 cm FM capacities, just imagine as you press the PTT line . . .

"Beam me up, Scotty!" . . .

TECHNICAL SPECIFICATIONS: ICOM IC-12AT TRANSCEIVER

Specification	Claimed
Frequency Coverage	1260–1299.99 MHz
Receiver Sensitivity	.32 uV for 12 dB SINAD
Squelch Law	.1 uV
Spurious Rejection	> 50 dB
Output Power: HI	1 Watt (measured on Bird 43)
LO	0.1 Watt (measured on Bird 43)
Current Drain: (receiver squelched)	65 mA
Unsquelched, max. audio	250 mA
Transmit, low power	400 mA
Transmit, high power	900 mA

by Bryan Hastings KA1HY

Number 10 on your Feedback card

Yaesu FT-727R The First Duoband HT

More Features in Less Space

Yaesu USA
17210 Edwards Rd.
Cerritos CA 90701
Price Class: $520

Yet another stride has been made to pack more and more features into less and less space. In November of last year, Yaesu began marketing the FT-727R, an FM handie for the 2m and 70cm amateur bands. This HT, with the FNB-4A battery pack, measures approximately 8" high x 3" wide x 1½" deep and weighs a little under 1½ lbs. It hosts a daunting array of features. This review discusses how relevant, and even how employable, some of these 40-odd functions are.

Take note that the first version of this handie had some limitations, and Yaesu soon replaced it with the present model in February, adding $30 to the price tag. This review covers the present model.

The top panel of the rig, where the female BNC connector for the antenna is located, has three push switches for 0.5W/5.0W Power Out, Lamp, and VOX; the Squelch and On/Off/Volume controls; and three jacks for earphone, mike, and "Computer-Aided Tuning"(CAT). More about CAT later.

You might expect a dual-band rubber duck to compromise somewhere. Indeed, 70 cm gets short shrift with the supplied YHA-27 flex antenna. Several people reported getting much better performance out of a ¼"-wave on 440 MHz, though they had no troubles getting out on two with the YHA-27.

Sensitivity for the VOX is set by the High/Low small recessed slide switch on the FT-727R's back panel. Take note that the VOX function works *only* with an external audio output and mike, such as the Yaesu YH-2 Headset. This makes sense when you consider the feedback problem resulting from the internal mike picking up audio from the speaker—they are less than an inch apart. Unfortunately, there's no readily accessible control for the VOX delay, and I find the delay too short.

Photo A. Front panel of the Yaesu FT-727 dual-band HT for 144- and 440-MHz operation. Power output is 5 Watts with the battery pack shown.

The LAMP on/off switch is very handy. Many HTs, like many digital watches, provide switches which have to be kept manually depressed to keep the lamp lit. The lamp adequately illuminates the LCD readout screen, though unevenly, since it is located on the lower right of the screen. The keys on the keypad glow green when the lamp is on.

The right side panel has the Tone Burst/PTT, and the left, the FUNC, press switches. All three have good detent, though you have to be careful to press the right switch when using the PTT, since it is located under the same rubber covering as the Tone Burst.

The ON AIR/BUSY and BATTERY lamps are at the top left of the front panel. Moving down this panel from them, we find the speaker (approx. 1¼"diameter) and mike, then the multifunction LCD screen. Below the screen is the 20-key keypad, each with a primary function, marked on the key, and an alternate function, marked above the key and activated by the FUNC switch.

727R Keyboard Functions

How do these functions shore up? The '727R has most of the now-standard features of HTs—ten memories; frequency dialing from a numerical keypad, which can also be used as a touchtone pad; standard and programmed frequency offset entry; band, programmed, and memory scan; and frequency lock. A beep option acknowledges keystrokes, useful here since the keypad keys don't have good detent. The beep, however, is the same tone for any key depressed.

Two less common features are the SAVE function and battery life display. The save function allows the user to save on current drain in the receive mode by turning the receiver off for up to 9 seconds, and then reactivating for ½ second. There is a cycle timer on the screen that counts down to "0" before the frequency display. The radio will stay in receive as long as there is a signal present. In the present version, the battery-saver function restarts after transmitting. In the old version, key-up deactivates the battery-saver function.

The battery command lets the user monitor battery drain by a voltage display on the screen. The scan function is adequate but has some limitations.

First, it takes almost two minutes to scan one megahertz in 10-kHz steps. Second, there's no way to mask out unwanted frequencies in a scan. Finally, the programmed scan is awkward. A conventional programmed scan is set by entering the two boundaries of the scan and the step size. The FT-727 requires you dial in the starting boundary, then the number of steps to take. You have to calculate the number of steps by the step size to get the scan range!—and that

range is limited to 99 steps x 10 kHz/ step = 990 kHz, or just under one megahertz. Also, when the receiver stops at a busy frequency, the programmed scan deactivates. To scan the same portion of spectrum, you have to first dial in the original boundary. All in all, the programmed scan is limited and cumbersome to use.

The FT-727R's memory capacity is quite adequate. It has 10 memory cells, and you can store non-standard offset frequencies in the first four. This is a big improvement over the original model, which accepted only three standard offset frequencies into memory (the other 7 cells were for simplex). You can set and enter the offset into a memory conventionally by using SHIFT and the − or + repeat key. The alternate (and easier) method, however, is to enter the receive frequency into memory, and then dial up the transmit frequency and enter *that* into the same memory cell, using the TX M command.

The memory mode is easy to use. It requires only 2 keystrokes to enter a dialed frequency into memory and only one keystroke to recall a memorized frequency when the rig is in the memory mode. There is also a CALL (priority) memory, a frequency that can be recalled with a single keystroke.

One curious feature is cross-band operation, with the transmit and receive in different bands. I went up to the local Pack Monadnock mountain and hooked up with Ted W1ALE in Concord NH (40 miles NE, as the electromagnetic wave flies). He has both a 440 and 2m repeater in Concord. I transmitted on two and received on 440. Imagine the confused looks on the faces of the people monitoring the one-way conversations on each machine! I am hard put to think of a real use for this feature. A dual-band *single sideband* handie would be really neat for OSCAR 10 work.

The combined S-meter/Power out/Memory cell indicator is a clever design. All of this is represented by a 10-element (each element numerically labelled) LCD bar graph at the bottom of the screen. When in memory mode, only the element of the memory cell called up shows. Its only failing is that the display doesn't return to the original memory cell flag after transmitting in memory mode.

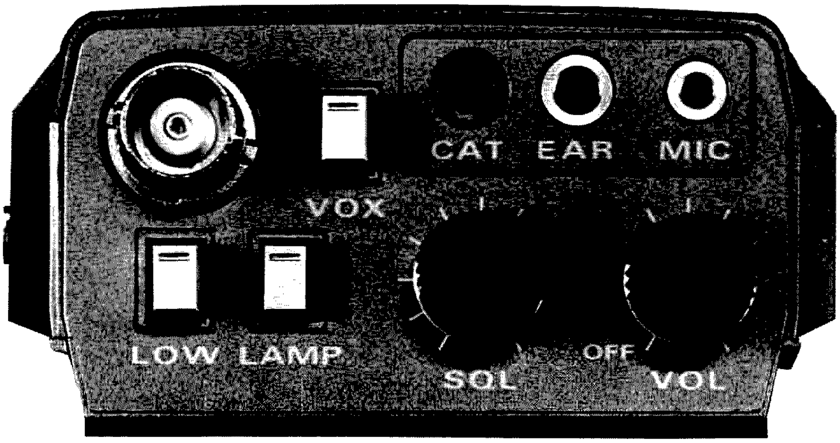


Photo B. Top panel of the 727R.

FT-727R TECHNICAL DATA

	2-m	70-cm
Standard Frequency Coverage	144–148 MHz	440–450 MHz
Power Output	4.5 W(HI)	3 W(HI)
	0.5 W(LO)	.3 W(LO)
Squelch Law	.18 µV	.17µV
Sensitivity		
(10-dB quieting)	.25 µV	.25µV
(20-dB quieting)	.45 µV	.4 µV
Selectivity	±15 kHz	±12 kHz
	(< 20 dB)	(< 30 dB)

Just What Is CAT?

Computer-Aided Tuning means remote control of the rig from a computer's serial port, and a number of Yaesu transceivers use CAT. Digital data is transferred serially at 4800 bits/second. The proper initializing command from the computer prompts an acknowledgement response from the '727R, a process called "handshaking". All functions on the rig can be controlled from the computer. Rig memory is limited only by the memory of the computer, and the rig's scan rate can be increased from 1–2 channels/second to up to about 3–4 channels/second.

"Calculate the number of steps by the step size to get the scan range!"

Yaesu wasn't fully prepared to support CAT when they introduced the rig on the market. Charlie N3CXO made several unsuccessful attempts to obtain the ASCII codes from Yaesu about a month or so after the new version of the FT-727 came out. Engineering Consultants in Brea, California, produced the first software/hardware package to interface the '727R with a computer (Commodore 64) only last June. According to Bob NI6R this lag occurred because they had to "reverse- engineer" the 727R. They received only scanty programming data from Yaesu. This package will soon be available from Engineering Consultants for the IBM PC, and another package will soon be available from Applied Solutions in Garden Grove, California. Now programming data is also available from Yaesu.

The '727R is very easily modified for out-of-band operation. There is a switch on the rig that clears the CPU, and it can be reprogrammed by a 6-digit initialization code entered on the keypad. There is a code that isn't listed in the operation manual which expands the coverage of the rig to 100–199 MHz and 400–499 MHz. The FT-727R has not been type-accepted by the FCC for this operation.

Conclusions

This is by no means an exhaustive review. I can't comment on the rig's tone squelch operation (subaudible tone encoding/decoding), which functions only with the FTS-6 option board, and, of course, the CAT needs a full review.

The rig is well isolated. Last week I took a walk deep into the woods to gaze at our beautiful fall foliage and to find a relatively RF-free spot, and in scanning both bands, the squelch opened only twice—for activity on two local repeaters. This is also an ideal rig for those with 2m repeaters that have a remote control input on 440 MHz.

The FT-727R's main shortcomings are the programmed scan and slow scan rate, compromise rubber duck on 440 MHz, and Yaesu's weak support for the CAT feature. The rig is a bit pricey at $520, but I found it state-of-the-art and completely reliable in my several months of operation.

The Complete 2m/70cm Mobile Station

By now, you may have thought it would be great to convert the FT-727R into a mobile station, but where in the world am I going to find a dual-band power booster and outboard antenna? These units are already on the market! Be on the lookout for my next review which will feature the World Systems Engineering WP-727DX Power Booster and Rad-Com's new DDRR antenna, the CR2/4A "Untenna".

My thanks to Charlie N3CXO, Bob NI6R of Engineering Consultants, and Michael Henderson N6JFD of Yaesu USA, for sharing their experiences with the 727R with me.

Andrew Mill KD2WA
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Number 3 on your Feedback card

FT-209 Modifications

Jump to New VHF Frequencies.

Don't you wish your Yaesu FT-209R/RH or 709R would go above 150 or 450 MHz like ICOM's HTs do? I did, so I called the Yaesu service center to find out how to go about doing this. The technician I spoke with told me this was "secret" information, but allowed that their equivalent commercial units have the same microprocessors as the FT-209 and FT-709 HTs.

That's all I needed to know. I opened my radio, heated the soldering iron, and proceeded to jump pins in the control unit until I found the correct configuration. [Ed. note. this is *not* a recommended procedure!] The following are the results.

The Mods

The modifications are:

- •Extended frequency coverage
- •Enhanced power saver
- •Improved scan feature
- •Increased receiver sensitivity.

The extended frequency modification allows you to program the lowest and the highest receive and transmit frequencies. The enhanced power saver allows receive times 0.4 to 4.0 seconds, in 400 millisecond steps. The new scanner stops on a signal and waits for the conversation to conclude, and then restarts scanning after two seconds. Finally, a quick tune-up of the RF amplifier increases receiver sensitivity.

Doing the Work

To open the radio, first remove the battery pack and and turn the radio on and off once to discharge the circuitry. Next, remove the the four screws holding the battery track and pry it out. Remove the two screws holding the belt clip and the one beneath it. Also, remove the two screws holding the carrying strap to the radio.

Now, slide a flat jeweller's screwdriver in from the bottom, between the black side trim and the radio, until it stops. Twist the screwdriver, and the trim should pop off. Now remove the two side screws and slide the U-shaped back cover off. At this point, be careful not to damage the electronics. Now, remove the four tiny Phillips-head screws holding the front panel into place, then fold the panel to the right (in the 709R, you have to desolder a ground jumper on the left-hand side.)

The Jumpers

Take the following steps to extend the frequency coverage on the 209R/RH:

1. Jump (solder across) pins 1, 7, 9, 10, 11, 13, and 16. Leave the pre-soldered pins alone.

2. To extend the power-saver, jump pin 12.
3. Remount the front panel with the four small Phillips-head screws.

4. Standard VCO range is 136–153 MHz. To move the VCO span up, turn TO1 (on the control board) clockwise (inward) one to two turns, one turn at a time. TO1 is located in the 1" x ¾" shielded enclosure. This is the left hole when the unit is face-down and bottom toward you.

I adjusted the VCO to span 142–157 MHz to prevent lostpower and sensitivity in the ham bands. You may have to remount the battery track, reset, and program the unit for 150–160 MHz, and move TO1 until RF output is indicated on *no higher* than 156.5 MHz.

5. To get improved sensitivity, remove the front cover, dial 146 MHz, and, with a generated signal, tune TO2, TO3, and TO4 for maximum signal. These are the three consecutive cans from the antenna jack on the receiver board (under the speaker).I found mine to be each ½ to 1 turn off. Also, adjust TO5, the fifth can from the antenna, for maximum signal.

Follow the steps below extend the frequency coverage for the 709R:

1. Same as for the 209R/RH, plus jump pin 4.

2. The power-saver modification can't be done here unless pin 12 is present.

3. Same as for the 209R/RH.

4. Same, but the VCO range 430–455 MHz. If TO1 is adjusted inward about two turns, the range shifts to up to 439.5–465 MHz.

5. Not necessary for the 709R.

6. Resolder the ground jumper between the control board and ground.

This completes the modification section. Reassemble the unit.

The Programming

When you finish the modifications and reassemble the unit, reset it once more. The programming:

1. In the first memory, enter the lowest receive frequency and dial, and in the second memory, enter the highest receive frequency and dial.

2. In the third memory, enter the lowest possible transmit frequency and dial, and in the fourth memory, enter the highset possible transmit frequency and dial.

3. Enter repeater shift F, and SHIFT

Here is a sample program for the FT-209R/RH:

reset
1451D
1570D
1440D
1480D
0600shift

This memorizes a receiver range of 145.1–157 MHz, + a transmit range of 144–148 MHz, and a 600-kHz repeater shift.

A sample program for the 709R:

reset
4420D
4650D
4400D
4500D
5000Fshift

This memorizes a receiver range of 442–465 MHz, a transmit range of 440–449.975 MHz, and a 5-kHz repeater shift.

The Performance

There is a loss of sensitivity in the lower 2 MHz of the band on the FT-209R/RH model, but, if the VCO is tuned as above, the ham bands aren't affected. There's no perceptible loss of power or sensitivity on the FT-709R.

In conclusion, go ahead and jump—and make your 209R/RH and 709 better than before! 73

Andrew Mill is a high school senior whose hobbies include current HT modification.

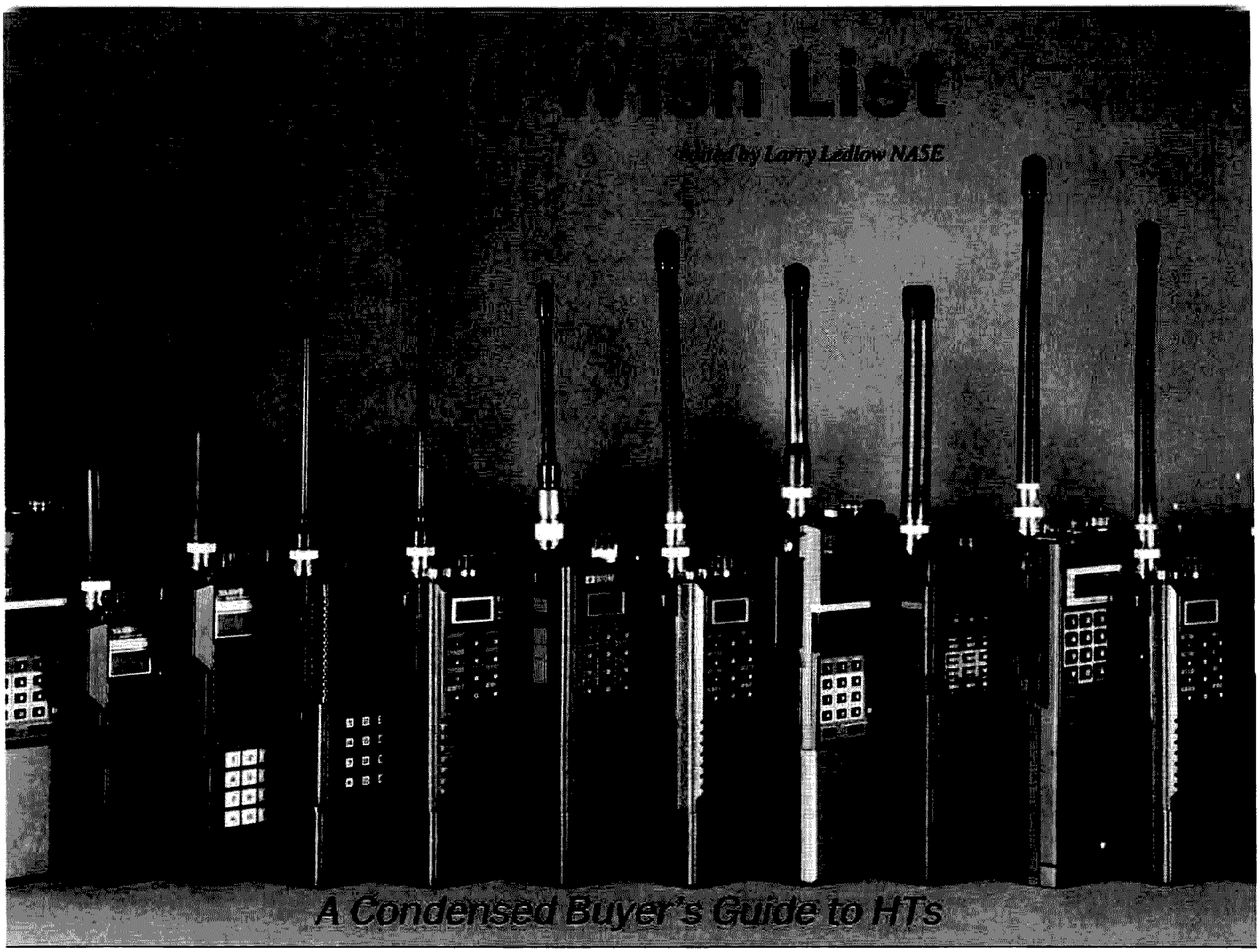
Public Service Scanning with Ten Tec HT

by Fred Lehman WD8MGO

The Ten Tec 2-meter HT can scan 149–158.995 MHz with just a few keystrokes. Follow these simple steps.

1. F V 0.000
2. F ∧ 8.995
3. F 0 STEP 15 kHz (or your choice)
4. F MS PS

The handheld will scan upward from 150 MHz. To tune between 149.000 and 149.995 MHz, follow step 1 above then V LWR. This portion of the band must be tuned manually using the LWR key. Happy listening!



The lives of hams shopping for a hand-held transceiver used to be simple. They only had to keep a few models and specifications in their head. For a while they could almost make the choice by tossing a coin. No longer! Now hams have a daunting selection of HTs, and even those folks dedicated to a single manufacturer must choose between two or three models for the same band. To ease the burden a bit, we have distilled a bevy of manufacturers' brochures into a reasonably complete list of hand-held transceivers available in the US marketplace.

About the Chart

Frequency coverage of modern synthesized rigs is generally very broad. Those units with microprocessor controls are extremely versatile and often cover MARS, CAP, or public service frequencies without modification. Many HTs receive or transceive well outside their published frequency limits, although some degradation in performance is possible. Note that it is *illegal* to transmit on a non-amateur service frequency using a rig without an FCC type-acceptance certificate, even if you have a license for that service! Some manufacturers do not publish frequency coverage specifications outside the ham bands.

Some companies brag about how much power their HTs produce and then sock the buyer with a surprise. More often than not, high power specifications require either an optional external DC power supply or a heavy duty battery pack. Don't forget the heavy duty charger for the battery pack, too. The combination can run well over $100 extra for high power options. Also, high power

> **"More often than not, high power specifications require either an optional external DC power supply or a heavy duty battery pack."**

HTs tend to get very hot during long transmissions, because the rear panel of the units serve as heat sinks for the power amplifier. It is not always pleasant or possible to hold a 5-watt HT for a long time.

Frequency entry or tuning is carried out manually (**M**) by stepping through the band or by direct keyboard entry (**K**). Naturally, for a fast change of frequency keyboard entry is the best choice. The higher-priced units universally offer this feature. Do not discount thumb wheels for fast QSY, though. You can normally make large frequency changes much faster with thumb wheels than with a manual toggle or electronic stepping.

Not so long ago liquid crystal displays (**LCD**) had a bad reputation. They were sensitive to shock and therefore unsuitable for the average HT operating environment. On modern transceivers, LCDs are sturdy and feature a lot of advantages over thumb wheel (**TH**) displays. LCDs often combine frequency display, S- and power output meter functions, memory selection, and other information. LCDs are also easily backlit for night viewing. Alinco offers a thumb wheel light, however, on its mini HTs.

Memories are always nice to have. If you have a lot of favorite frequencies to scan, then you probably want all the memory you can get. Almost all of the HTs with memories will store offset information with the frequency, but some will even store CTCSS tone information, too. Although we have not included all of the memory details here, they bear some consideration. On the other hand, if you're happy with that memory cell between your ears, you don't need a rig to help you along.

Automatic scanning saves a lot of work when looking for an active or clear channel.

Some rigs offer scanning only over the entire band (**B**), and others allow the user to program the limits of the search (**P**). Memory scanning (**M**) implies the rig can scan each memory consecutively. Some units allow the user to lock out selected channels. Still others allow the operator to select a scan stop strategy; e.g., stop on a busy or empty channel. We have not indicated these features on the chart. Priority scanning (**Y**) periodically and briefly searches a selected frequency for activity before returning to the main operating frequency. Manufacturers implement this feature in different ways, but the theory of operation is the same. It is a nice feature if you find yourself torn between two frequencies.

Standard repeater offsets in the United States are 600 kHz on two meters, 1.6 MHz on 220 MHz, and 5 MHz on 440 MHz. There are a few repeater operators who like to be different and use nonstandard offsets. With a fixed offset in your HT, you can forget about trying to be different. Some high-end handies allow programmable offsets, but this is far from an essential feature.

Various tone sets are available on HTs these days. DTMF (**D**) tone pairs allow access to autopatch facilities (if you know the access code) to make telephone calls. Some repeaters have interesting auxilliary functions that are controlled with DTMF tones. Time of day, temperature, repeater system status, and other data can come through your handy with a sophisticated repeater or base unit. CTCSS (**C**) tones are also called sub-audible tones, and they come in 37 standard frequencies. Some repeaters require a CTCSS tone to activate. Again, some repeater operators like to be different. This also helps cut down QRM. CTCSS tone selection is usually made with a DIP switch, though a few rigs offer CTCSS selection from the keyboard. We have not differentiated these methods in the chart.

The tone squelch feature (**S**) found on many rigs today is handy for those HT owners who like to be different. Tone squelch operation requires CTCSS *de*coding. In other words, the rig will not receive signals without the proper CTCSS tone encoded on them. Do not confuse this feature with a digital squelch function, which requires a series of DTMF tones to alert the radio's owner that someone wants to talk to him.

Most hand-held transceivers have BNC antenna connectors. This is virtually an industry standard. Kenwood and Alinco use "Thread-lock" (**THL**) connectors on their pocket-sized HTs. The thread-lock connector looks a bit like an RCA phono jack with threads. Note the nonstandard TNC antenna connector on the IC-12AT, too. Use of nonstandard antenna connectors makes attachment of other antennas or external amplifiers difficult at best.

We have listed the manufacturer's suggested retail price. If you pay the full amount, you probably won't be able to afford your subscription renewal to *73*. We like to think our readers are frugal and sensible. Check dealers for deep discounts and closeout specials. A little telephone shopping can save a lot of money. Consider the savings in sales tax when buying through out-of-state mail order. UPS or priority mail shipping costs on these little rigs are unlikely to match sales tax in some states. And make sure you tell the dealer you saw the information in *73*!

Brand	Model	Frequency (MHz)	Power Out	Freq. Entry	Display	Mem.	Scan	Offset	Tones	Ant.	Price	Comments
AEA	DX Handy	28.0–29.0[1]	2W	M (VXO)	Analog	0	No	NA	No	BNC	$319.95	SSB/CW
Alinco	ALX-2T	140–149.995	2W	M	TH	1	Y	Fixed	D,C	THL	$250	Mini HT
Alinco	ALX-4T	440–450	1W	M	TH	1	Y	Fixed	D,C	THL	$TBA	Mini HT
Alinco	ALM-203T	144–147.995	5W[3]	M,K	LCD	10	M,P	Prog	D,C	BNC	$328	Rx 150–160 MHz
ICOM	IC-u2AT	140–149.995	1.5/3W[3]	M	LCD	10	M,B	Prog	D,C	BNC	$329.00	Rx 140-169.995 Mini HT
ICOM	IC-2AT	144–147.995	1.5/2.5W[3]	M	TH	0	No	Fixed	D	BNC	$299.00	
ICOM	IC-02AT	140–151.995	3/5W[3]	M,K	LCD	10	M,P,Y	Prog	D,C	BNC	$365.00	
ICOM	IC-3AT	220–224.990	1.5/2.5W[3]	M	TH	0	No	Fixed	D	BNC	$339.00	
ICOM	IC-03AT	220–224.995	3/5W[3]	M,K	LCD	10	M,P,Y	Prog.	D,C	BNC	$449.00	
ICOM	IC-u4AT	440–450	1.5/3W[3]	M	LCD	10	M,B	Prog	D,C	BNC	$369.00	Mini HT
ICOM	IC-4AT	440–449.995	1.5/2.5W[3]	M	TH	0	No	Fixed	D	BNC	$339.00	
ICOM	IC-04AT	440–449.995	3/5W[3]	M,K	LCD	10	M,P,Y	Prog.	D,C	BNC	$449.00	
ICOM	IC-12AT	1260–1299.99	1W	M,K	LCD	10	M,P,Y	Prog.	D,C	TNC	$459.00	
Kenwood	TH21BT	141–150.995	1W	M	TH	0	No	Fixed	D,C[2]	THL	$259.95	Mini HT
Kenwood	TH31BT	220–225	1W	M	TH	0	No	Fixed	D,C2	THL	$269.95	Mini HT
Kenwood	TH71BT	440–450	1W	M	TH	0	No	Fixed	D,C[2]	THL	$269.95	Mini HT
Kenwood	TH205AT	142–148.995	2.5/5W[3]	M	LCD	3	B	Fixed	D,C[2]S2	BNC	$259.95	Rx 141–163 MHz
Kenwood	TH405AT	440–449.995	2/5W[3]	M	LCD	3	B	Fixed	D,C2,S[2]	BNC	$269.95	
Kenwood	TH215A	141–151	2.5/5W[3]	M,K	LCD	10	M,P,Y	Prog.	D,C,S[2]	BNC	$349.95	Rx 141-163 MHz
Kenwood	TH415A	141–151	2.5/5W[3]	M,K	LCD	10	M,P,Y	Prog	D,C,S[2]	BNC	$359.95	Rx 141-163 MHz
Santec	ST-20T	142–150.995	3/5W[3]	M,K	LCD	10	M,P,Y	Prog	D,C	BNC	$369.95	
Yaesu	FT209R/RH	144–147.995	2.5/5W	M,K	LCD	10	M,P,Y	Fixed	D,C,S[2]	BNC	$359.00	RH price given
Yaesu	FT109RH	220–224.995	5W	M,K	LCD	10	M,P,Y	Fixed	D,C S2	BNC	$379.95	
Yaesu	FT709R	440–449.957	4.5W	M,K	LCD	10	M,P,Y	Fixed	D,C,S[2]	BNC	$ 359.95	
Yaesu	FT23R	144–148	2/5W[3]	M	LCD	10	B,Y	Fixed	D[2]C2,S[2]	BNC	$269.95	Mini HT
Yaesu	FT73R	440–450	2/5W[3]	M	LCD	10	B,Y	Fixed	D[2]C2,S[2]	BNC	$279.95	Mini HT
Yaesu	FT727R	144–148/440–450	5W	M,K,Y	LCD	10	M,P	Prog	D,C2,S[2]	BNC	$499.95	CAT System input

Note 1: AEA's DX Handy covers any two 50 kHz segments of the 10-meter band. Requires crystals
Note 2: Available as an option.
Note 3: Higher power output with an optional battery pack or DC power supply.

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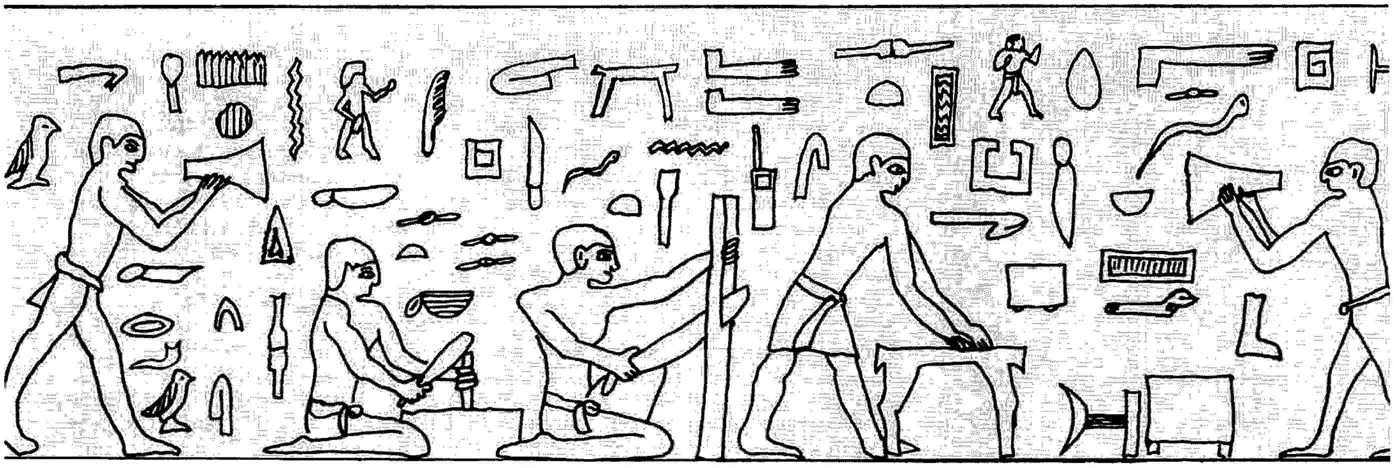
Number 9 on your Feedback Card

A History of Hand-Held Communications: Their Place In Western Civilization



A partial transcript of a pseudo-scientific study of man's never-ending quest for hand-held personal communications, presented by the alleged Dr. Fosman at a recent meeting of S.C.A.M. in Paris.

Numerous experts and scholars agree that one of man's instinctive needs is communication with other members of his species. This fundamental need is grouped with other essentials such as thirst, hunger, sex and home video. Indeed, research in this area has revealed that even the higher primates have demonstrated an amazing capacity to grasp the concepts of speaker microphones and flex antennas.

The Beginnings

Cave drawings from the Stone Age have revealed, upon closer inspection, a central figure coordinating the group hunt of a Mastodon with a ram's horn strapped to his left wrist. Other scholars have uncovered similar drawings in Asia Minor. One group from a leading East Coast university claims to have found evidence of the world's first repeater. The drawing in question depicts members of the hunt some distance from the leader with ram's horns attached to one ear apparently repeating instructions through their wrist units.

Studies of the so-called "Golden Age" period in the fertile crescent point to an interesting development. The growth of metropolises such as Baghdad and Babylon are coupled to the simultaneous rise in the use of personal horn units, each with individualized low-level resonance, or "sub-tone" characteristics. The latter was determined by the shape of the horn and the length of time it lay bleached in the sun. There has been conjecture that the legend of the Tower of Babylon may have arisen because ground stations were all creating different "sub-tones" and the repeater attendants atop the tower couldn't understand the hundreds of messages bombarding their receiving horns.

> **"Evidence exists of experiments via tropospheric scattering using horn blasts across the Nile."**

The Egyptians were believed to be the first in developing the principal of a reflector with gain characteristics to aid in carrying messages over longer paths than previously attained. Indeed, the pyramidal design of these massive structures lends itself very well to this function, and evidence exists of experiments via tropospheric scatter using horn blasts across the Nile. These often occurred before intense thunderstorm activity, and may have been crude attempts at using a repeater system to warn of impending severe weather.

Further Advancements

The Romans carried the Egyptian research a step further by siting their repeaters along the extensive aqueduct system crisscrossing Gaul. They discovered that very large horns placed strategically along these routes could capture weaker signals using the reflective characteristics of the walls of the duct, allowing more distant spacing of the manned repeaters. This effect was later called "aquaducting", and many references are made of the phenomenon in writings of that period. The Romans are also credited with using bronze and copper horns to replace the more fragile ram's horn.

Memory storage came into being with the introduction of mynabirds into Europe by African traders. A typical repeater with memory storage might employ up to 10 horns placed along the focus of several aquaducts. Each horn would employ a mynabird in a cage placed at the focus of the horn. With suitable prompts, the attendant would be able to record messages sent from distant ground units of up to 5 words. By placing the apparatus on a revolving platform, the attendant could scan the various messages as needed.

Or, by placing a cloth over any particular mynabird's cage, he could lock out any undesired channels by causing the bird to go to sleep.

During the epoch of the Holy Roman Empire, alchemists of the period developed a technique by which mynabirds and parrots could be trained to repeat their messages into an adjacent horn for automatic retransmission. When no further transmissions were needed or desirable, two intertwined strands of rope could be pulled from below to release covers over each cage. History thus credits them with inventing the fully automatic unmanned repeater station with "twisted pair" control. Further development came when the Saxons employed the turntable concept of the Romans to further speed up the process.

Hand-Held Advancements

Developments in hand-held horns were keeping pace. As stated earlier, the fragile ram's horn had been replaced by units weighing a few ounces which were made from copper or bronze. These latter types were preferred by Hannibal's army when he invaded the Alps, due to more stable dimensional qualities in colder temperatures. Copper models came equipped with more than one horn to allow multi-channel operation. Some deluxe models were made for members of the ruling classes and high officials of the Roman Catholic Church by expert goldsmiths and metalworkers. These luxury models incorporated a tiny sundial to tell time, and up to four discrete horns.

At this time, contacts made with Asian civilizations revealed that they were also working on advanced hand-held horn units, cast entirely from ceramic to withstand high temperatures and the effects of salt air. These units found immediate favor with Portuguese and Italian traders, replacing the corrosion-prone copper and bronze models used on ships. Another development came when larger horns with more gain were installed alongside the major piers and docks of European seaports for ships in port using conventional small horns with limited range. The user would place the opening of his small horn near the focus of the larger fixed horn, resulting in a louder signal. These "docking boosters", as they became known, revolutionized sea travel.

During the Middle Ages, the popularity of these hand-held units became immense, and it followed that a profusion of repeaters sprang up in major metropolitan areas. In many cases, the outputs of these repeaters were so close to each other that users experienced considerable interference. Attempts by the repeater attendants to increase the horn size and thus the power of the signal proved fruitless, and resulted in interference to other nearby repeaters. Regional leaders agreed to meet on a voluntary basis at a site near present-day Paris to annually discuss the location and operation of their repeaters, thus originating "repeater councils". Penalties for violators were stiff, including execution and exile.

Experiments were being conducted by the leading scientists of the time to improve message storage and capacity. One of these was Da Vinci, who experimented with various forms of parrots as opposed to mynabirds. He claimed that East African parrots offered over 256K of storage as opposed to the 128K found in the common mynabird. Opponents argued that the parrot would prove more temperamental and less reliable in automatic repeater service. Other experiments involved the use of mockingbirds for night-time transmissions. Hand-held designs continued, with a wide variety of models offered for sale. One of the more popular units employed a clever scheme, mounting a smaller horn coaxially inside a larger unit.

This allowed simultaneous transmissions on two different channels, giving rise to "full duplex" operation. However, existing repeaters could only handle one message at a time, so use was limited to loosely organized clusters of fishermen who passed weather information among themselves while in port.

These groups, known as "fishermen's nets", proved an efficient means to conduct discussions among two or more users.

"The Court of Louis XIV favored an elaborate model manufactured in Italy."

As in most societies, secrecy of communications was of paramount importance both in times of war and in everyday transmissions between government agencies. It is not known who actually discovered the technique, but writings recovered from Greece, Malta and Carthage show a scheme employing the honeycomb of bees inserted in horns to purposely distort the audio for all but a similarly-equipped horn. The effect to the average listener would sound like a distorted "buzz". However, this "cellular" technique was never perfected and fell out of favor.

Attempts were made to ensure secrecy by attaching sections of pipe between adjacent buildings so that users could talk in confidence. This technique became known as "private line" and continued for many years, and indeed was the standard method for communications between adjacent villas in the Vatican. However, long range security remained a problem, as the only reliable method in use involved "carrier" pigeons, which could easily be downed in flight and any messages read. Some innovative attendants evolved a scheme wherein the parrots used in a repeater could be released in flight to travel to another distant repeater site. In this way, they could retransmit their stored messages over greater distances. Again, a sharpshooter could down the flying bird and "capture the repeater", precluding its use by others.

Time Marches On

Repeaters aided in navigation. On Columbus' initial voyage, his lookout climbed to the crow's nest and, using a small, lightweight ceramic hand-held horn from Japan (which was popular at that time) made contact with the repeater on San Salvador Island in the Bahamas Chain, leading to his now-famous discovery of America. John Cabot explored and mapped the northern coast of the continent by using a large co-linear array of multiple horns to produce echos. Henry Hudson introduced repeaters and bronze hand-held horns to Native Americans. He is credited with installing the first repeater sites in New York City.

Hand-held units continued their evolution. The Court of Louis XIV favored an elaborate model manufactured in Italy, which incorporated two sundials, 6 horns, and numerous tiny bells which served no apparent function except as a decoration. To get the attention of a repeater attendant several miles distant, a whistle was attached to be used prior to each series of transmissions, thus originating the term "whistle-up the repeater". This is also the first documented appearance of "bells and whistles" on hand-held units.

Ornate hand-held units also found their way to the colonies of America, and many of these were pressed into service during the Revolutionary War. Ben Franklin, who was fond of tinkering with gadgets, developed a system of linking several horns and birds together at a repeater location to allow multiple channel operation simultaneously.

This solved a technological puzzle that had existed since the Middle Ages when multichannel horns became popular. Using a system of elastic bands to suspend a homemade acoustic chamber resembling a cross, Franklin then focussed four repeater horns so that the received audio could cross-over through the center port and go out any of the others, depending on which ports were closed or open. This technique, which Franklin named "cross-band linking", was an overnight sensation.

One common problem with all horn repeaters was their susceptibility to vandalism. Young boys bent on a prank would often stuff the horns with any number of objects. Some even dumped pots of homemade berry preserves into the ports (much to the delight of the birds). This action was the source of the expression "jamming the repeater". Fortunately, they usually ate some of the jam themselves and were quite sloppy about it. The telltale stains gave them away, so finding these jammers was simply a matter of being observant.

NOTE: Reprints of the unabridged transcript of Dr. Fosman's presentation are available from WIFF (The World Is Flat Foundation).

Professor Fosman's professional interests include psycho-historical studies of ancient cults and their followers. His latest monograph, The ARRL 1932-35: The Golden Years, *will appear at booksellers in the spring.*

Number 23 on your Feedback card

FUN!

Ham Radio's Lighter Side

John Edwards KI2U
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FUN POLL: HOW HAMS VIEW THEMSELVES

OSCAR 1, the Benton Harbor Lunch Box, The Dayton Hamvention, W1AW—all ham radio legends. And now you can add the FUN! Poll to that august list.

Look at it this way, you do anything long enough and it becomes a legend. Since this is the seventh FUN! Poll, I say it's long enough and declare this venture a legend.

The questions are below. Answer them and help me track the trends in this hobby. Send your responses to the address at the top of this column. If you have a modem-equipped computer, you can also respond via CompuServe (70007,412), The Source (CPA117) or MCI Mail (JEDWARDS).

Have fun. After all, how often do you get to participate in something legendary? 73

Element 1—Background

1) Sex:
A) Male B) Female

2) Age:
A) 15 or below
B) 16–21
C) 22–39
D) 40–59
E) 60 or above

3) License class:
A) Novice
B) Technician
C) General
D) Advanced
E) Extra

4) Number of years licensed:
A) 1 year or less
B) 1–5 years
C) 6–10 years
D) 11–20 years
E) 21 years and up

5) Do you have a new (post-March '78) call?
A) Yes B) No

6) How many hours a week do you devote to amateur radio?
A) 0–1 hours
B) 2–5 hours
C) 6–10 hours
D) 11–20 hours
E) 21 hours or more

7) Which HF band do you use most?
A) 80/75 meters
B) 40 meters
C) 20 meters
D) 15 and/or 10 meters
E) Don't operate HF

8) Which VHF/UHF band do you use most?
A) 6 meters
B) 2 meters
C) 220 MHz
D) Higher frequencies
E) Don't operate VHF/UHF

9) Which mode do you use most?
A) SSB
B) CW
C) FM
D) RTTY
E) Other

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, and club and other incidental expenses.)
A) $0–$250
B) $251–$500
C) $501–$1,000
D) $1,001–$2,500
E) $2,501 and up

Element 2—Social Characteristics

11) On the whole, hams are:
A) Too young
B) Too old
C) Just the right age

12) Do you like rock music?
A) Yes B) No

13) Politically, how would you define yourself?
A) Conservative
B) Middle-of-the-road
C) Liberal

14) Should we get rid of the ARRL?
A) Yes B) No

15) How old were you when you first became a ham?
A) 15 or below
B) 16–21
C) 22–39
D) 40–59
E) 60 or above

16) Should the FCC increase the speeds on amateur CW examinations?
A) Yes B) No

17) Do you own a home computer?
A) Yes B) No

18) If you answered "yes" to question 17, which brand?
A) Apple
B) IBM
C) Radio Shack
D) Commodore
E) Other

19) Do you think that home computing is siphoning people (including youngsters) away from amateur radio?
A) Yes B) No

20) Are hams getting dumber?
A) Yes B) No

21) Do business interests deserve some of our virtually abandoned bands?
A) Yes B) No

22) Should ham licenses have a minimum age requirement?
A) Yes B) No

23) Should ham licenses have a maximum age requirement?
A) Yes B) No

24) Should hams be subject to periodic retesting?
A) Yes B) No

Element 3—Habits

25) If the users were restricted to data communication only (no phone or CW operation), would you be in favor of a no code 220-MHz Digital-class license?
A) Yes B) No

26) Would you be in favor of such a no-code 220 MHz Digital class ticket if it permitted phone operation in addition to data transmission?
A) Yes B) No

27) Have you ever used a personal computer in connection with your amateur radio activities?
A) Yes B) No

28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsibility for ham operation to the amateur community?
A) Yes B) No

29) What do you think of CW keyboards?
A) Love them
B) Hate them

30) Should we get rid of, or reduce in size, the CW bands?
A) Yes B) No

31) Do you think DX nets have a place in ham radio?
A) Yes B) No

32) Do you think nets in general have a place in ham radio?
A) Yes B) No

33) The next time a ham operates from space, which band should he/she use?
A) 2 meters
B) 220 MHz
C) 450 MHz
D) An even higher band
E) Shouldn't bother to operate

34) If, while tuning across a band, you heard a net called "Jammers International" in progress, would you:
A) Jam it
B) Ignore it
C) Complain to the FCC or some other organization
D) Listen
E) Join it

35) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes B) No

36) If required, could you pass the FCC theory test for your license class?
A) Yes B) No

37) Have you ever purposely operated in an amateur sub-band you weren't licensed to use?
A) Yes B) No

38) Are you fluent in any computer language(s)?
A) Yes B) No

39) If you answered "yes" to question 38, which language(s)?
A) BASIC
B) Pascal
C) Assembler
D) Machine
E) Other

40) Do you feel yourself competent to write a short BASIC program?
A) Yes B) No

41) Do you feel yourself competent to replace the finals in a transistor-type rig?
A) Yes B) No

42) Do you solder together your own coax connectors?
A) Yes B) No

43) Do you smoke while operating?
A) Yes B) No

44) Do you operate a packet radio system?
A) Yes B) No

45) What do you think of contesting?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

46) What do you think of DXing?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

47) What do you think of repeaters?
A) Great
B) Good
C) Okay
D) Don't like them
E) Despise them

48) What do you think of traffic handling?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

49) If you heard an emergency net in progress, would you immediately join in and offer your services?
A) Yes B) No

50) Have you ever secretly hoped for a minor disaster to strike your community so you can demonstrate your radio skills?
A) Yes B) No

Response Form

Instructions: Read each question and mark your response by circling the appropriate letter next to the number of the question.

Element 1:	9) A B C D E	16) A B	**Element 3:**	33) A B C D E	42) A B
1) A B	10) A B C D E	17) A B	25) A B	34) A B C D E	43) A B
2) A B C D E		18) A B C D E	26) A B	35) A B	44) A B
3) A B C D E	**Element 2:**	19) A B	27) A B	36) A B	45) A B C D E
4) A B C D E	11) A B C	20) A B	28) A B	37) A B	46) A B C D E
5) A B	12) A B	21) A B	29) A B	38) A B	47) A B C D E
6) A B C D E	13) A B C	22) A B	30) A B	39) A B C D E	48) A B C D E
7) A B C D E	14) A B	23) A B	31) A B	40) A B	49) A B
8) A B C D E	15) A B C D E	24) A B	32) A B	41) A B	50) A B

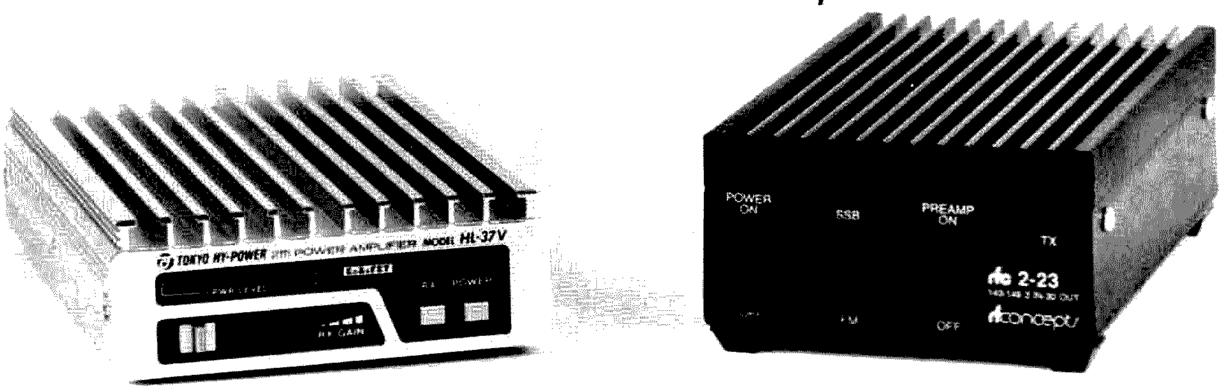
Number 16 on your Feedback card

73 Review

by Pete Putman KT2B

Power Play Comparison

RF Concepts RFC 2-23 and Tokyo Hi-Power HL-37V 30-Watt 144-MHz Power Amplifiers



Tokyo Hi-Power Labs
Subsidiary of Encomm, Inc.
1506 Capital Ave.
Plano TX 75074
Price Class: $100

RF Concepts
2000 Humboldt St.
Reno NV 89509
Price Class: $112

What would an issue about handhelds be without a review of the most popular hand-held accessory? Here I've chosen two representative models of hand-held amplifiers (one US-made and one from Japan), each designed to take a nominal 2-watt input and amplify it about 10 dB. In addition, both feature GaAsFET preamplifiers for weak signal reception.

Background

Hand-held amplifiers aren't new. Over the past ten years design refinements have brought us from 10-watt power levels up to the current 25- and 35-watt units, which are nesting in ever-increasing numbers under car seats and in gloveboxes.

RF Concepts is a relatively new company, founded by Everett Gracey and Ken Holladay in early 1987. Both originally founded Mirage Communications in the early '80s, which was later purchased by KLM. RF Concepts offers a wide range of power amplifiers for 2 and 220 MHz, and new models for 432 MHz will appear soon. All employ GaAsFET preamplifiers.

Tokyo Hi-Power is the amplifier subsidiary of Encomm, a Texas-based importer and distributor of a wide range of VHF/UHF products, including Santec handhelds, Welz SWR meters, and Kenpro antenna rotors. They, too, have a wide range of power amplifiers to cover 144 and 432 MHz, and most of their designs use GaAsFETs.

PERFORMANCE MEASUREMENTS

Specification	*RFC 2-23*	*HL-37V*
Rf Power/DC Current: Input/Output	.3W/6W@2.0A 1.5W/25W@3.7A 2.5W/35W@4.4A	.5W/20W@3.8A 1.0W/25W@4.4A 2.0W/30W@4.6A
Measured SWR at input:	1.2:1	1.5:1
Preamplifier Gain:	14.5 dB	13.0 dB
1-dB Compression, output:	-11.0 dB	+2.0 dB

Description

Photo A shows the two amplifiers side by side. Both are small enough to stash just about anywhere. The RFC 2-23 measures 1¾" H x 3½" W x 5¾" D, and the HL-37V measures 1½" H x 4" W x 5¾" D. The RFC 2-23 is finished in a satin black, while the HL-37V comes in a brushed aluminum shade.

Front panel layouts differ somewhat. Controls for DC POWER, SSB/FM mode and PREAMP ON/OFF are rocker switches on the RFC 2-23. LEDs indicate when the amplifier is on, when the preamp is enabled, and when in transmit. On the HL-37V, pushbutton switches turn POWER on and enable the preamp, marked RX. The mode setting for SSB/FM is located on the rear panel. In addition, the HL-37V features a slider control for RX GAIN (more on this in a moment), and a bargraph LED display to show power output level.

Both radios use standard SO-239 connectors. The RFC 2-23 has a detachable DC power cord with Molex connector, while the HL-37V power cord is hard-wired. The former's power cord is somewhat heavier, using #16 wire as opposed to the #18 wire on the HL-37V. It shouldn't make much of a difference if you install with the supplied cords. Failing that you should use heavier wire where possible (#16 or better).

Photo B shows the interior of the RFC 2-23. The power device is a Motorola SRF3961, which works in a 12-dB configuration. Work-

manship is of the highest quality, and there are only two tuned circuits using ARCO trimmers. The design is very similar to Mirage amplifiers, as you might expect. RF-sensed keying is used exclusively, with the SSB/FM switch setting the drop-out delay. This is largely due to the primary market for these amplifiers, FM hand-held users. Protective diodes are used around the GaAs FET, a CF300 device with nominally 20-dB gain at a noise figure of about 1 dB. In addition, an automatic SWR protection circuit will kick in at about 3:1 VSWR. RF Concepts rates the maximum RF input at 5 watts, which I could not verify. Minimum input is specified at 200 mW, with approximately 30 watts output for 2 watts drive.

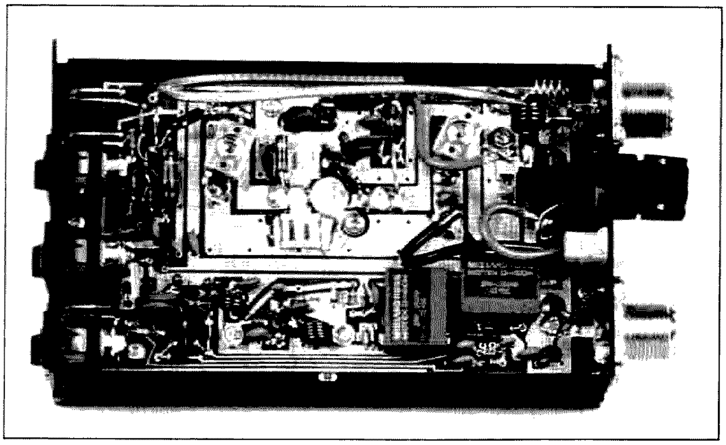


Photo B. Interior view of the RFC 2-23 amp.

Photo C shows the inside of the HL-37V. The active device is a 2SC1946A, also running about 10–12 dB gain. The amplifier does not use tuned circuits, but rather etched inductors and small fixed-value capacitors. Workmanship here is also very high quality. The PC layout is considerably more open than the RFC 2-23, but this is no comment on the engineering design.

The unit also uses RF VOX keying on both SSB and FM modes. No other provision is made for hard-keying, again for the reason that the majority of buyers will operate FM only. A 3SK121 GaAsFET provides a nominal +14 dB gain, and a unique slider control allows continuous adjustment of the RX gain from -20 dB to +14 dB. Protective diodes also isolate the GaAsFET.

Why the slider? Apparently in some places in Japan, there is so much RF on and near the 2-meter band that preamps tend to go berserk in the intense RF fields. The average unaided front end of a hand-held is similarly affected, so having a variable attenuator is a great help!

In practice, the adjustment to give unity gain is nearly 80% of full setting.

In contrast to the RFC 2-23, the Japanese unit affords no no VSWR protection. The manual strongly cautions that you should have a low (1.3:1 or better) VSWR reading before using the amplifier. In practice, it probably wouldn't make much difference until at least 2:1 or better. Most modern solid-state power devices use ballasted emitter protection to guard against excessive collector current.

Performance

Check the table for performance measurements. All tests were performed using an IC-2AT with different battery packs as the exciter. Bird 43 wattmeters and a Bird Termaline dummy load were also used to measure power input and output. For receive measurements, an HP 608F with Boonton 92 millivoltmeter was employed.

Some observations regarding the data. First of all, the variance in input VSWR of each amplifier caused the power input levels themselves to vary during the power tests. This is due to the impedance mismatch as shown by the Bird 43. If the VSWR approaches 1.5:1, the impedance looks more like 75 or 37 ohms. The readings for input and output power are close to the manufacturers' specifications in each case since both specify a maximum output of 30 watts.

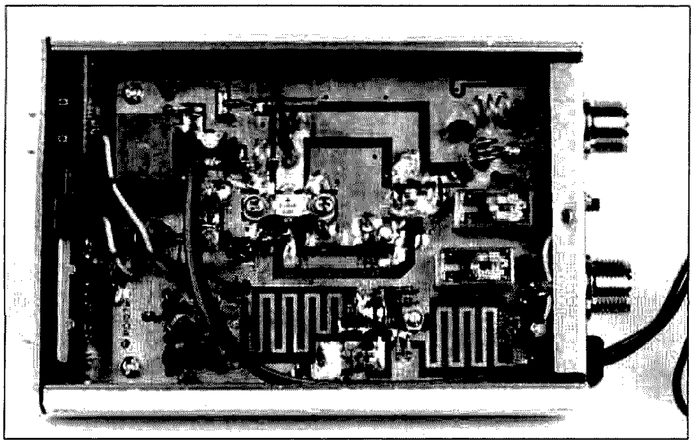


Photo C. Interior view of the THL HL-37V amp.

The pre-amplifier in the RFC2-23 didn't come close to the claimed spec of 20 dB. How-ever, 14.5 dB is more than adequate for normal FM work. The HL-37V was much closer to its rating of +14 dB, which again is more than enough for an amplifier of this type.

As far as compression tests go, the HL-37V passed with flying colors. I've stated in the past that a well-designed GaAsFET for 2 meters ought to exhibit a 1-dB compression point at better than 0-dB output, and +2 dB is fine. The RFC 2-23, however, exhibited such a poor compression characteristic that I called Ken Holladay of RF Concepts. He suspected that the Schottky diodes used to protect the GaAsFET were causing the compression, and this makes sense. Ken also suggests that users switch the preamplifier off in high-level RF areas. The manual also recommends this.

When do you know you are neara high-intensity RF field?!? It may notbe apparent, but you could be the victim of intermodulation products causedby a nearby repeater or commercial radio installation while otherwise engaged in normal point-to-point communications. This could also happenif an amateur in your neighborhoodoperated with high power on 2-meter SSB while you were on an FM simplex net, for example. From the data above,it stands that a signal level of -24 dBwill cause the preamp to go into compression. (-24 dB corresponds to about 12 millivolts, a fairly strong level but not unusual.)

Conclusions

You can place both radios into your car as you wish. Both manufacturers recommend mounting the amplifiers with the supplied brackets to allow suffi-cient airflow over the heatsink, whichwill get warm to the touch in extended FM use. Keep in mind the slider op-tion on the HL-37V. You may wishto tailor the front-end performance to suit your tastes in areas with plenty of RF.

Both of these amplifiers are of the set-it-and-forget-it variety. Just hook them up and hide them under your seat, under the dash, in the trunk, or wherever. The power output display on the HL-37V is not a guide. You'll run over 20 watts output with half a watt input and close to the maximum output with 1 watt.

Some additional thoughts: to get the most out of these amplifiers, use heavy-duty wire for the DC lines, and low-loss coax, such as Belden 9311, RG-58, or RG8X, between the amplifier and your HT. You may encounter a slight mismatch with the HL-37V and have to experiment with cable lengths. The input impedance of the RFC 2-23 is close enough to 50 Ohms, so lengths aren't critical. 73

NEW PRODUCTS

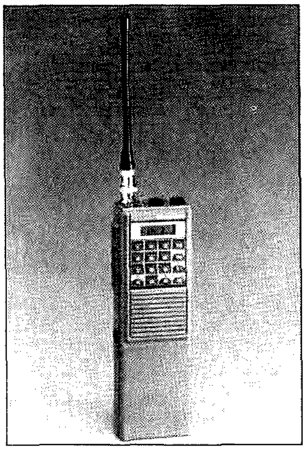
Compiled by Rebecca Niemela

MIDLAND LMR

Midland LMR has introduced new **Wideband Frequency-Synthesized Two-Way FM Portable Radios (Model 70-254)** that cover up to 30 MHz, at full rate specifications, without returning. The portables can be programmed by an authorized technician for up to 16 channels. The new wideband Midland portables have built-in programmable tone-coded squelch, DTMF signaling and channel scanning capability. Controlled from a front key-panel, the radios can scan 20 channels per second with choice of priority and carrier, CTCSS or open channel scanning. A mode-lock key on the panel keeps the portable configured as the user sets it up. The units have diecast chassis with metal back-plates and weather-resistant seals. The price for the New Wideband 16 Channel UHF Portable Radio (Model 70-254) is $700.

Options include a 1000 mAh battery pack, chargers, a speaker-microphone, belt clips, cases and a variety of signaling formats.

For more information contact Midland LMR, Marketing Department, 1690 N. Topping, Kansas City MO 64120 (800/643-5263 X-1690). Or circle Reader Service Card #201.



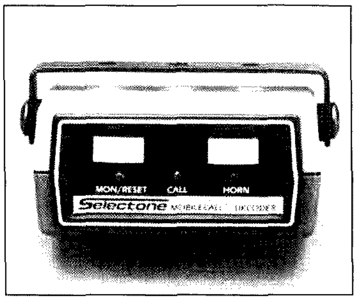
Midland's Model 70-254 two-way FM portable radio.

SELECTONE

Selectone Corporation is announcing its new **ST-216 Mobilecall** decoder. It was initially developed for GE, but it now replaces both the ST-215 Two-Tone Sequential and the ST-121 Burst Tone decoders in the Selectone line. Employing the same dash-mounted control head as the ST-215 and ST-121, the new ST-216 is compatible with *any* two-tone format including Motorola Quick-Call II, GE Type 99, Reach, and Plectron, with all functional outputs required for most selective calling applications. The new Mobilecall Universal Decoder offers field selectable frequency range, tone timing and intertone interval, compatible with all known two-tone sequential formats, and can also perform as a Burst (single) Tone decoder. The user has the choice of extended tone 1 or tone 2 for group call applications. The decoder will operate on any frequency between 275 and 3000 Hz and is field tunable.

In operation, the ST-216 mutes the speaker to block out unwanted traffic until it receives the correct tone code. Then, a latched relay output unmutes the speaker, sounds a field-selectable momentary or continuous alert buzzer, and turns on a front-panel LED indicator. The user may opt to select a horn mode which causes a 3-second horn beep. The Mobilecall Universal Decoder can be reset by an off-hook condition or by punching the Reset/Monitor switch on the control panel. The new ST-216, backed by a 5-year parts and labor warranty, is $119.

More information is available from Selectone Corporation, 23278 Bernhardt Street, Hayward CA 94545; 415-887-1950. Or any of the authorized Selectone distributors. Circle Reader Service Card number 202.



ST-216 Selectone universal two-tone decoder.

DAVLE TECH

This Personal Grounding Wrist Strap is an essential part of static-proofing the electronic work station for assembly workers and laboratory personnel. It protects sensitive devices from static charges generated by the operator.

The most important feature of this wrist strap is that it is suitable for any size wrist. The coil cord offers oxidation prevention, 6 ft., 360° swivel and high function resistor. A strong grip banana plug and crocodile clip provide sure grounding. $9.

More information is available from Davle Tech Inc., 2-05 Banta Place, Fair Lawn NJ 07410 (201/796-1720). Or circle Reader Service Card #220.

LUDVIGSON TONEGEN

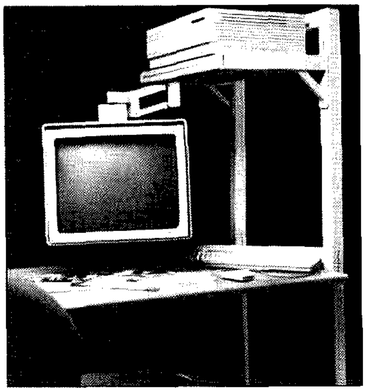
The new Ludvigson Tonegen software for the Commodore 64 turns the computer into a versatile test instrument. The program provides triangle, sawtooth, and squarewave signals from several milliHertz to 3.950 kHz with virtually flat amplitude response and better than 0.07% frequency accuracy. In addition, the software package simulates rotary dialing at 10 pps. Two-tone sequential tones are programmable by the user, and the 12-key DTMF simulator can send strings up to 40 characters long. The list doesn't stop there. The program can also generate color bars, vertical, horizontal and crosshatch lines. Motorola two-tone page tones are also featured, as well as look-up tables for Motorola and CTCSS tone equivalents. The program even calculates ERP, antenna and feedline parameters, and power conversions. Copies of the program on disk are available for $12.

Contact David Ludvigson, 415 N. Duluth, Sioux Falls, SD 57104 for more information.

ERGOTRON INC

Ergotron announces availability of the **Ergotron Engineering Workstation**, a suspended radial arm computer workstation designed to reclaim useable desk space by suspending the monitor and the processor above the work surface. If there isn't desk space to organize work and lay out projects, the system's effectiveness is limited. The new Ergotron Engineering Workstation takes a totally new approach to workstation ergonomics. This free-standing workstation sits alongside your desk and provides a unique arm suspension system and shelf area giving the operator the ultimate in system adjustability and space savings. This unique combination of arm and mechanism allows the user to move up to an 80 lb. monitor to any position with just a touch of the hand. The Workstation improves operator comfort by reducing glare and eye, neck and back strain and provides for far better utilization of available desk space. This combination of benefits will result in dramatic improvement in operator productivity. The suggested retail price for the Ergotron Engineering Workstation is $500.

For more information contact Ergotron, Inc., 1621 East 79th Street, Minneapolis MN 55420 (800/328-9839 or 612/854-9116). Circle Reader Service Card #204.

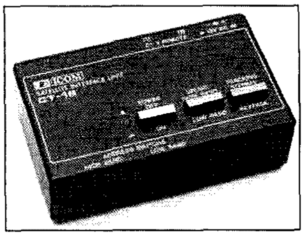


Ergotron Engineering Workstation.

NEWS FROM ICOM

Instant satellite communications are now possible with ICOM's **CT-16 Satellite Interface Unit** when used with an ICOM CI-V System Transceiver. The CT-16 features an uplink transceiver and a switch to select either normal or reverse tracking. The CT-16 may also be used in coordination with the UX-14 CI-IV/CI-5 converter. Suggested price is $98.

For more information circle Reader Service Card #205 or contact ICOM America, Inc., 2380-116 Ave. NE, Bellevue WA 98009 (206-454-8155).



ICOM's CT-16 satellite interface unit.

The Banker

An Accessory for the Kenwood TS-940S/AT

by Paul D.A. Hoang NA1A

Inventron Labs
PO Box 1881
Brookline MA 02146
Price: $50

I just love my Kenwood TS-940S/AT. And from what I hear on the air, lots of people feel the same way. It seems like 25 percent of those I work on 20 meters are using one! The design of the '940 is superb in every way except one. And the "Banker" overcame this deficiency.

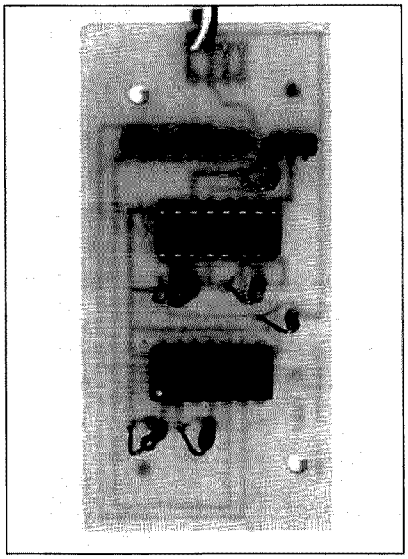
Although the radio itself has four banks of 10 memory channels (total of 40 memories) that store both frequency and mode, I suspect most people use only one bank. Why? Because the switch for changing banks is located under a sliding cover on top of the radio—along with such seldom-used controls as the VOX gain and FM mic gain! It's just too much hassle to get to the switch, and I was concerned about bumping the other controls. Besides, until recently, the rig sat on a desk with a shelf directly over the cover, so I couldn't even get to the switch. I just left the rig on bank 1 and sacrificed the other memories. No doubt most of the other '940 owners do the same thing.

I work several modes, including RTTY and AMTOR. I was always frustrated by insufficient memory to store all the frequencies I use. When an ad appeared for The Banker, I jumped at the chance to retrieve the other 30 memories for $50.

The product is a small board that mounts inside the rig in place of Kenwood's voice synthesizer option. Usually, the voice synthesizer is used only by sight-impaired hams—most of us don't have one. Once installed, the Banker lets you change memory banks by pressing the voice switch on the '940's front panel. This is especially convenient, because the voice switch happens to be right next to the memory buttons.

Installation

The unit couldn't be easier to install. It comes with extremely detailed instructions, including both schematic and pictorial diagrams. The manufacturer even tells you how to orient the rig and where to put the screws as you work. The board goes in without a hitch. Two supplied screws secure the board, which is then plugged into the two connectors normally used for the voice synthesizer.



The Banker offers easy access to the TS-940S/AT's memory.

There is one other plug on the end of a short wire, and it connects to one in the radio about two inches from the board. This plug had me puzzled at first. It's a two-pin right-angle thing I've never seen before. It snaps into the rig's connector in an odd way, paralleling the existing wires. All together, I took about ten minutes to install the board, and the radio did not require any other changes.

Before using the product, you should set the rig's bank switch to bank 4. This lets the Banker take over and is explained in the instructions. I set my switch, closed the cover (forever!) and I was in business! Now, when I press the voice button, the memory bank advances by one each time, just as if I had moved the bank switch up a notch.

Although I don't record shortwave broadcasts, the instructions tell how to use the rig's bank switch to preset a memory for timer recording. Even though the Banker is installed, you can still use the old bank switch settings. This clever trick lets you preset the rig so the Banker doesn't have to use any backup power to remember which bank you want to appear upon power-up.

Notes

I can't find anything negative about this product. It is simple, effective, and easy to use. It is all CMOS, so it takes practically no power when the rig is on, and none at all when it is off. I can remove it, should I ever want to, just as easily as I installed it. It comes with a one-year warranty, so I'm not worried about failure.

At last, I have easy access to all four memory banks. Inventron Labs has filled a gap, giving me convenient and complete use of all my '940's features. Now, if I could only get it to call "CQ" for me... 73

John Neeley K6YDW
3236 W. Dorothea Avenue
Visalia CA 93277

Number 4 on your Feedback card

Mobile Extender Using VOX Control

Wire up your transceiver to jump over mountains.

Volunteers have a history of providing quality communications in time of need. Hams were asked to provide communications in our area at several disasters, namely the Coalinga Earthquake (1984) and several forest fires. We found a critical need for hand-held units, but due to terrain and obstructions, these low-power units were occasionally unable to access the repeaters. The following adaptation of the transceiver will help to overcome the obstacles we encountered.

In reviewing our dilemma at a subsequent critique, we concluded that we needed a highly portable remote base unit capable of accessing our repeater plus the ability to work with the hand-held units.

Previous approaches in *73* have dealt with cross-band remote bases by going inside the transceiver to find the COR point to provide control of the PTT of the remote base. Yet today's transceivers are so complex due to synthesizers, CPUs and memories that the average ham would not dare to open the cover. So here is a new approach. The following circuit offers an easy solution.

Circuit Description

Why not use VOX control instead of digging into the transceiver? This circuit centers around the LM3900 Norton op amp IC, which consists of four independent, dual input, internally compensated amplifiers which runs off a single power supply voltage. This op amp uses supply volt-ages from 4 VDC to 36 VDC with very low drawn current.

Looking at one section of the circuit drawing, you see where to pick off the audio speaker output from this transceiver, which goes through a small audio transformer (T1) to provide some impedance matching. This AC voltage (about 10 V rms) must be changed to DC voltage, so the 110 Ohm resistor (R3) and diode (D1) accomplish this task. Following D1 is a capacitor/resistor network that provides a timing function to delay the input (Pin 2) of the LM3900. This prevents words from entering the circuit and being chopped off at midpoint. This network also gives a short squelch tail on the output. At 'no activity', the voltage on Pin 2 is .15 VDC, and on Pin 3 it is .5 VDC. When Pin 2 detects activity, it goes high to .6 VDC and Pin 3 goes low to 0 VDC. The output (Pin 4) goes high to about 7.2 VDC.

"Volunteers have a history of providing quality communications in time of need."

The original prototype consisted of an NPN transistor driving a mini relay to accomplish the keying feature. The problem was excessive current drawn via the relay of approximately 80 mA on active. The appropriate circuit was in a packet TNC manual and used a MOSFET. The final choice was a heavier duty device than normally found in TNCs, however.

The IRF511 Power MOSFET was found at the local radio supply house. This device was about half the price of the relay. The IRF511 has very low on-state resistance combined with high transconductance, and the capability of sinking 3 amperes. When the gate of the MOSFET is driven high, the drain goes low. The only voltage on the drain pin is supplied by the relay voltage of the transceiver. The drain pin on the IRF511 has a maximum voltage of 60 VDC. Parallel to the drain pin on the MOSFET is an over-voltage protection circuit consisting of a Zener diode (Z1) and a .01 disc capacitor (C3) to prevent voltage spikes from destroying the MOSFET.

The circuit that comprises R10, 2N2222 NPN, LED and R13 is an indicator to tell when the channel is active. The LED is mounted on the front panel. This portion of the unit is not mandatory, but does give good visual indication of the system in use.

The transmit/audio section is not elaborate. The capacitor (C7) and resistor (R16) were chosen to give the best audio response. The speaker/audio input to the Extender is tied to the microphone input of the other transceiver through this series capacitor/resist-

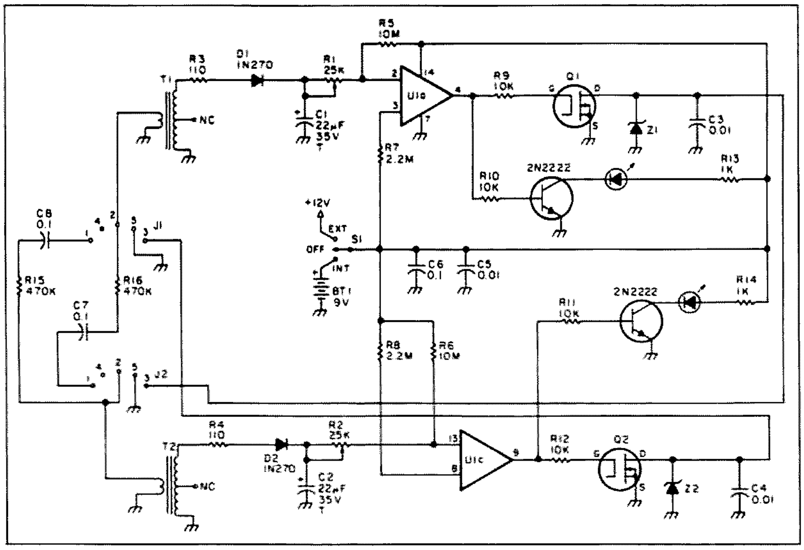


Fig. 1. Circuit diagram for mobile extender.

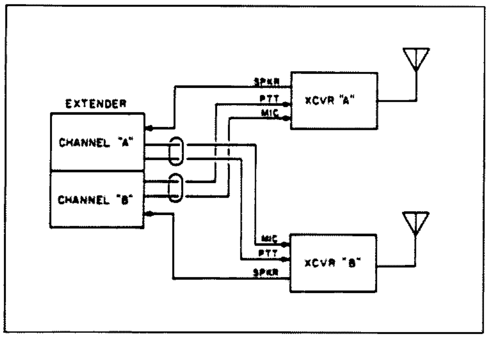


Fig. 2. Flow chart and wiring.

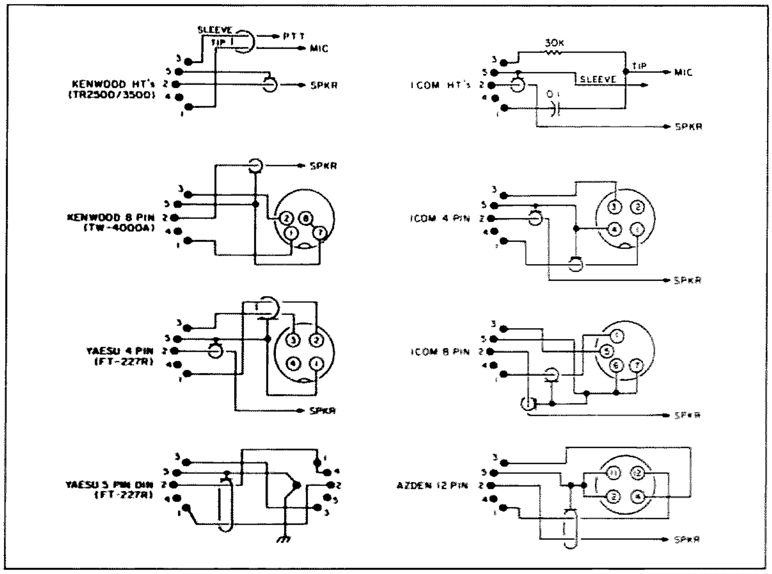


Fig. 3. 5-Pin DIN plug output to various radios.

or network. These values may change depending on your transceiver.

Tying It All Together

The wiring chart indicates that it is a very simple circuit to interface. XCVR "A" speaker output goes to channel "A" input. Channel "A" output (PTT/MIC) goes to XCVR "B" microphone jack (reverse for the other channel). XCVR "A" should be on your repeater channel (or can be on simplex). XCVR "B" can be on any unused Simplex Channel or on another VHF/UHF band. If XCVR "A" is on a 2-meter repeater channel, then XCVR "B" can be on either 220 or 440 mHz.

To make this circuit a repeater, set each XCVR on the frequency you want, and set the mode switch to Simplex. Disconnect the PTT/MIC cable from XCVR "A" and the Spkr plug on XCVR "B".

This version, using the power MOSFET for keying, dropped the current drain to 9 mA, active. This made it very practical to use an internal 9-volt battery supply. SI is an On-Off-On switch for selecting either the internal or external power source.

To use this unit, plug in the appropriate cables to the transceivers. Adjust the volume controls to about half-way on each transceiver for inital tests. By selecting an active repeater frequency on XCVR "A", and listening on another receiver on XCVR "B", adjust the volume control on XCVR "A" so the audio quality is not distorted into the receiver listening to channel "B". Do the same on XCVR "B".

If you have installed the LED indicators, you will notice that when either of the receiver squelch drop out, the LED will remain on for a few seconds. This delay can be adjusted by turning the 25k pot (R1/R2) to a desired setting. This changing of the hang time will also affect the timing characteristics on Pin 2 of the LM3900. You may have to adjust both the volume control on the transceiver and the 25k pot to get the timing where you want it.

I made my unit with a small 4" x 4" premade circuit board, using point-to-point wiring. A custom-made circuit board could be produced reducing the size by half. A box measuring 4" x 6" x 2" was used to house the unit with the I/O jacks, power switch and external power jack on the rear panel.

When the extender is in operation you will first notice a silence upon release of the PTT on the unit you are operating. Approximately 2 seconds later, you will hear the distant repeater squelch tail, or beep tone. When you talk to the extender from your unit, it takes a short time for the extender to detect your voice and key the other unit which goes to the repeater. Remember, this is VOX. Any pause will let the extender drop out after a second or two. A good practice is to say, Aaaah, just as you key your unit, in order to activate the extender. This will take some practice when you operate through the extender.

Comments

This circuit has worked quite well. It has been used successfully with two handheld units, mobile units and base stations. The diagrams for various units depict the wiring for the cable assemblies.

The project can come to good use at parades, public events, and search and rescue work. Remember, you've just created a remote base or repeater, so you must say "remote base" or "repeater" with your call sign when you use the extender.

Note: Any comments on this project are welcomed, and a SASE will be appreciated.

PARTS LIST

Transformers		
T1, T2	8 Ohm: 1000 Ohm mini-audio xmfr	(RS273-1380)
Integrated Circuit		
U1	LM 3900 Norton OP Amp	(RS276-1713)
Transistors		
Q1, Q2	1RF511 Power MOSFET	(RS276-2072)
Q3, Q4	General Purpose NPN (2N2222, 2N3904, etc.)	
Diodes		
Z1, Z2	1N4752 1 watt Zener (33 v)	
D1, D2	1N270 or any diode	
Resistors		
R1, R2	25 kilohm mini-pot	
R3, R4	110 Ohm, ½ watt	
R5, R6	10 megohm, ¼ watt	
R7, R8	2.2 megaohm ¼ watt	
R9–R12	10 kilohm, ¼ watt	
R13, R14	1 kilohm, ¼ watt	
R15, R16	470 kilohm, ½ watt	
Capacitors		
C1, C2	22 mfd, 35 v Tant.	
C3–C5	.01 mfd, 50 v disc	
C6–C8	.1 mfd, 50 v disc	
Jacks		
J1, J2	5 pin DIN jacks	
Switch		
S1	on-off-on main-switch	
Battery		
BT1	9 volt alkaline battery	

Handheld Transceivers: Enjoyment Unlimited!

Handheld VHF and UHF FM transceivers are extremely popular units among today's radio amateurs, and with good reason. The flexible capabilities of these small "go anywhere" portables are ideal for talking with local friends and coordinating group activities in an on-the-spot manner, and their benefits during emergencies are truly invaluable. The large number of range-extending VHF and UHF repeaters located throughout our lands also assure reliable communications using low power transceivers. Since the wide variety of presently available handheld transceivers seems to make selecting a particular unit somewhat perplexing, however, ICOM wishes to share field-acquired insight via this issue's Tech Talk.

The prime considerations in any handheld transceiver are smooth operation, top-quality construction and performance, and long-run customer support. Initially, consider a unit that's comfortable to carry and operate, then review its less obvious and internal attractions. Extensive use of VHF and UHF bands, for example, always encourage high intermod immunity. That is, the ability to copy a weak signal without undue noises or squelch "falsing" when you're physically near other signal sources such as radio pagers, mobile phone relays, etc. Likewise, sincere factory-backed service is the single most important factor separating one manufacturer's products from others. **ICOM handhelds are proud pacesetters in all of the previously discussed areas: a reflection of ICOM's dedication to keep you communicating through all the exciting times ahead.** Three styles of ICOM handhelds are now available to fit your needs.

The new and exciting ICOM MICRO (IC-μ2AT) handheld has acquired immediate popularity, as it combines all of today's most respected assets in an easy-to-operate and extremely versatile package. Liberal use of narrowband filters plus high gain/low noise circuits ensure **maximum weak signal sensitivity, selectivity and intermod immunity.** Those designs, like all models of ICOM handhelds, are complemented by foldout pc boards mounted inside a **steel window frame-type subcase** for physical protection and electrical shielding. The complete unit is enclosed in a high-impact case.

As supplied with its attendant BP-22 slide on/off battery pack, the ICOM MICRO (IC-μ2AT) measures only 5.6 x 2.2 x 1.1 inches (H, W, D) and produces 1.6 watts output. Replacing that battery pack with ICOM's optional BP-21 reduces the transceiver's overall height to 4.6 inches while lowering RF output to 1.2 watts: the perfect shirt pocket or ladies' handbag companion. Alternately, substituting ICOM's optional BP-24 battery pack increases the IC-μ2AT's height to 6.6 inches while raising RF output to 2.6 watts for fringe/remote area use. Assuming the ICOM MICRO's (IC-μ2AT's) supplied 4-inch miniduck is then exchanged with a popular BNC-fitted gain antenna such as ICOM's optional ⅝ wave whip, **the transceiver's effective radiated power increases above that of much larger five-watt units.** Mixing and matching accessories thus allows the ICOM MICRO (IC-μ2AT) to "change face" on a moment's notice: a truly versatile transceiver!

Operating the ICOM MICRO (IC-μ2AT) merely involves step-tuning any of its 10 memories to a desired frequency (even 162MHz NOAA weather!) using its top-mounted rocker switches. Each memory continuously retains its last selected frequency. The ICOM MICRO's (IC-μ2AT's) transmitter offset is selected by a rear panel "simplex/+/-duplex" switch. If "odd split" operation is desired, hold the display's nightlight button, switch the transceiver on, then step-tune the .600 (kHz) reading to any desired separation. The ICOM MICRO's (IC-μ2AT's) PL tone frequencies are standard and can be selected via a mini DIP switch inside its battery retaining plate. A 440MHz MICRO, the IC-μ4AT, is also available for 70cm enthusiasts.

ICOM's IC-02AT, IC-03AT, IC-04AT and IC-12AT transceivers continue their reign of supremacy as today's most deluxe and full-featured handhelds. These advanced technology units include direct keypad operation, memory storage of frequency, standard or odd repeater splits plus PL tones. Three scanning modes and priority channel operation "round out" these popular units. Their operation may be simple or sophisticated as personally desired and/or expanding with your future interests. A pocket guide is also included with these top-quality units for initial operating convenience.

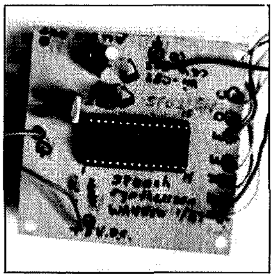
ICOM also continues producing the ever-popular and easy-to-operate IC-2AT, IC-3AT, and IC-4AT units. These "basic style" handheld transceivers are perfect for budget-conscious amateurs desiring to expand their VHF/UHF horizons using top performers of time-proven design.

ICOM handhelds are also supported by a full line of matching accessories and, excluding MICRO unit battery packs, they are **interchangeable** between transceivers. **ICOM is your full line, full-time amateur radio equipment supplier of incomparable quality, performance and service!**

Jim Braddy WA4DSO
3037 Audrey Drive
Gastonia NC 28054

Number 7 on your Feedback card

Make VIC Talk



This little chip offers big benefits.

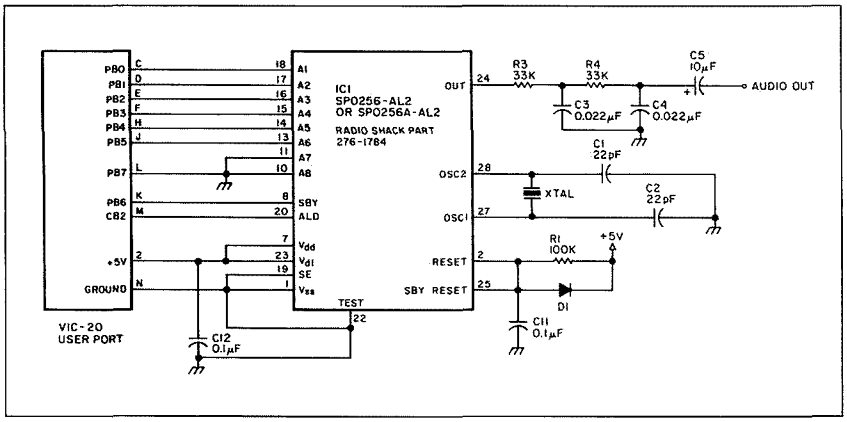


Fig. 1. Schematic diagram.

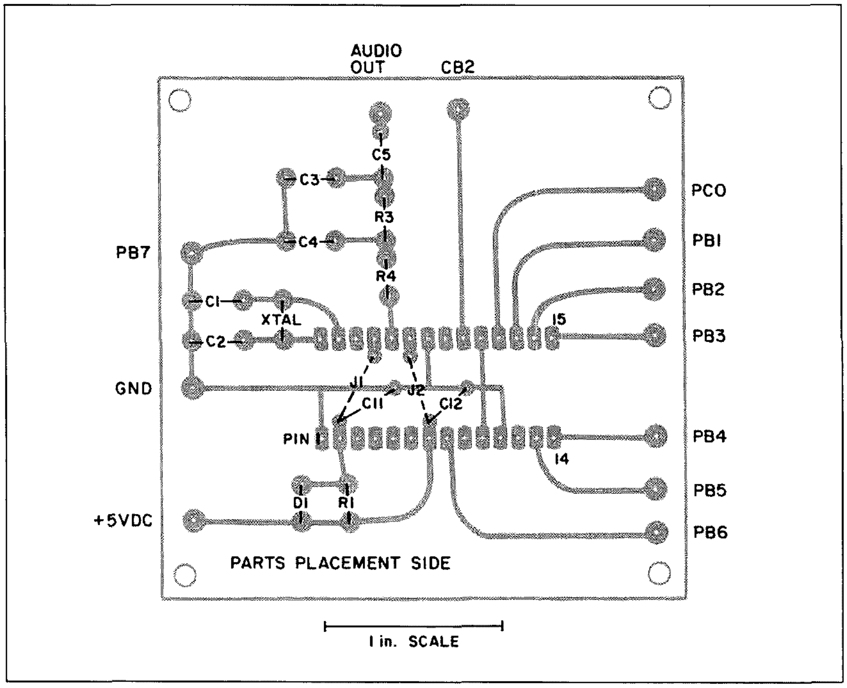


Fig. 2. Parts placement.

Do you want to teach your Vic-20 or Commodore 64 to talk? Here is a construction project that involves only one chip. It can be adapted to most PCs.

A talking computer offers many advantages: voiced I.D. for repeaters, talking clocks or thermometers, plus impressive games and teaching aids. All this and more is offered by a chip priced at $13 from Radio Shack.

Construction

The circuit can be put on a solderless breadboard. However, I have included my printed circuit pattern made from dry transfers. The parts are mounted on the non-foil side as usual, with the exception of jumper wires J1, J2 and capacitors C11, C12 which were soldered directly on the foil side (see Figure 2. Parts Placement).

The audio out requires outboard audio amplification. Fortunately, my computer monitor had an audio input. If this convenience is absent, almost any audio amp will do, including a very quick home brew using another Radio Shack chip, LM386, priced at $1. Instructions with the speech chip include audio amplification directions. Use shielded audio line to eliminate AC hum.

All other connections go directly to the user port on the back of your VIC-20. Ribbon cable would look good here; however, I used some surplus stranded hookup wire, courtesy of Ma Bell. CB2 on the user port of the VIC-20 is the one connection that differs on the C-64. In the case of the latter, use PC2 located at Pin 8. All other connections are the same for both computers.

Connection to the user port requires the 12/24 pin card edge socket. If you don't want to wait for your mail order, then get the 12/44 from Radio Shack and modify it with a hack saw. It helps to have a small two-inch bolt at both ends to get a grip on it with your fingers for mounting and removal from the back of the computer.

Frequency of the crystal will control the voice pitch. Instructions with the chip call for 3.12 MHz. However, a 3.579545 MHz TV

colorburst crystal from Radio Shack works fine, and it's cheap.

Using the Synthesizer

With a little basic programming it is easy to make the chip say any English word using an address table for data numbers as part of your program. The numbers must be in the form of decimal addresses. A booklet that comes with the chip offers a limited dictionary of words and details of how to make the chip speak them. It will also explain how to create more words. To help you get started, the sample program at right will teach your PC its first sentence. Notice that each line of data makes up a different word. You can change the data numbers to make new words and add more lines of data for longer sentences. Be sure to also change the "27" in line 65 to match the total of data numbers to be read.

For the C-64 you will need to change the following lines since its memory address locations controlling the user port are different from that of the Vic.

```
10 POKE 56579,63
40 POKE 56577,A
50 POKE 56577,0
60 PB=PEEK(56577)
```


References:

1. "Talk Is Cheap" by Thomas C. Johnson, WB6NQK, October, 1985, 73.
2. "Speech Synthesizer" by Ricardo Jiminez and Adrian Valle, August, 1986, Radio Electronics.

PARTS LIST

Resistors			
R1	100,000 Ohm		
R3, R4	33,000 Ohm		
Capacitors			
C1, C2	22pF ceramic		
C3, C4	.022uF ceramic		
C5	10uF, 10 volt, electrolytic		
C11, C12	.1uF ceramic		
Semiconductors			
IC1	SP0256-AL2 Speech processor	(Radio Shack 276-1784)	$12.95
D1	1N914 Switching Diode		
Other Components			
XTAL	3.12 MHz Crystal or 3.579545 MHz	(Radio Shack 272-1310)	$ 1.69
12.24 pin card edge socket (Jameco Electronics) or 12/44 pin modified to 12/24		(Radio Shack 276-1551)	$ 2.99
28 pin IC Socket		(Radio Shack 276-1997)	$ .89

SAMPLE VIC PROGRAM

```
10 POKE 37138,63
20 FOR J=1 to 27
30 READ A
40 POKE 37136,A
50 POKE 37136,0
60 PB=PEEK(37136)
70 F=PBAND64
80 IF F>64 THEN 60
90 NEXT J
100 DATA 24,6,0:REM I
110 DATA 7,7,16,2:REM AM
120 DATA 24,2:REM A
130 DATA 13,23,23,2,42,12,44,0:
    REM TALKIN
140 DATA 42,15,16,9,49,22,13,51,1,4:
    REM COMPUTER
160 RESTORE
170 FORT=1 TO 500:NEXTT:GOTO20
200 END
```

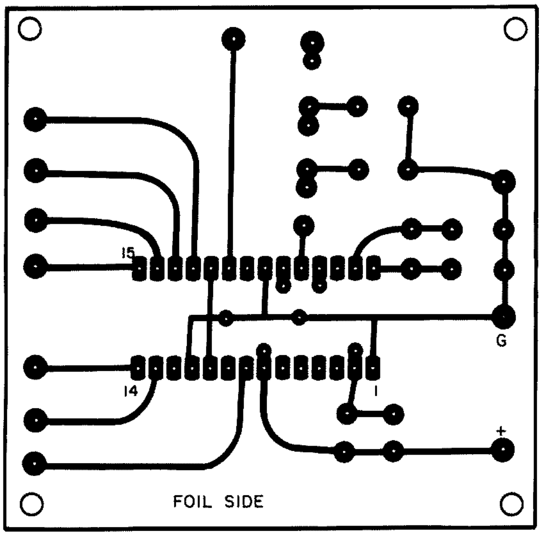


Fig. 3 Foil side.

AA	24	HOT
AE	26	HAT
AR	59	ALARM
AO	23	AUGHT
AW	32	OUT
AX	15	SUCCEED
AY	6	SKY
BB1	28	BUSINESS
BB2	63	BUSINESS
CH	50	CHURCH
DD1	21	COULD
DD2	33	DO
DH1	18	THEY
DH2	54	THEY
EH	7	END
EY	20	BEIGE
EL	62	SADDLE
ER1	51	FIR
ER2	52	FIR
FF	40	FOOD
GG1	36	GOT
GG2	61	GUEST
GG3	34	WIG
HH1	27	HE
HH2	57	HOE
IH	12	SIT
IY	19	SEE
JH	10	DODGE
KK1	42	CAN'T
KK2	41	SKY
KK3	8	COMB
LL	45	LAKE
MM	16	MILK

NN1	11	THIN	
NN2	56	NO	
NG	44	ANCHOR	
OY	5	BOY	
OW	53	BEAU	
OR	58	STORE	
PP	9	POW	
RR1	14	RURAL	
RR2	39	BRAIN	
SH	37	SHIP	
SS	55	VEST	
TH	29	THIN	
TT1	17	PART	
TT2	13	TO	
UW1	22	TO	
UW2	31	FOOD	
UH	30	BOOK	
VV	35	VEST	
WH	48	WHIG	
WW	46	WOOL	
XR	47	REPAIR	
YR	60	CLEAR	
YY1	49	YES	
YY2	25	YES	
ZH	38	AZURE	
ZZ	43	ZOO	
10ms	0	Pause	PA1
30ms	1	Pause	PA2
50ms	2	Pause	PA3
100ms	3	Pause	PA4
200ms	4	Pause	PA5

Table 1. Speech Processor Addresses.

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18 Zinzer Court
St. Louis MO 63123

Number 6 on your Feedback card

NiCd Charger/Power Supply

An easy two-in-one construction project.

Since I had accumulated a number of NiCd batteries and battery packs of various voltage and current ratings, I decided to construct a flexible piece of gear that would allow me to manipulate the battery charging cycles. The unit described here does the job nicely. It also serves as a variable power supply for the test bench.

The Circuit

To begin the project, I outlined the features and capabilities I required. I decided that 15 volts would suffice. I also needed no more than 500 mA of current for charging purposes. I found that the three-terminal, adjustable voltage regulators had a range of applications that would fit my needs.

These devices are available in several current ratings. The lowest is a 1-amp device which I would have used, except that it is in a TO-3 case. I wanted to use a TO-220 case, since it is easier to mount. I chose the National LM-317T 1.5-amp devices. The additional current capability is useful when using the unit as a power supply. I needed two regulators, one to regulate the voltage and the other to regulate the current.

Calculating the voltage required, and after factoring in the losses, I found that I would need a transformer with at least a 15-volt secondary. This would insure enough voltage for the regulator to operate properly when using the full 15-volt output. Radio Shack listed an 18-volt, 2-amp, center-tapped transformer with more capacity than needed, but the the price was right. I also found later that the LM-317T, with a good heat sink, would handle almost 2 amps.

With an 18-volt transformer, the available regulated voltage is approximately 20 V. Other users might elect to use a meter in the 20–25-Vdc range to take advantage of this additional voltage.

When I first constructed my unit, I had both regulators wired in series. This scheme worked fine as a current-limiting charger but required too much adjustment when the unit was used as a power supply. For this reason, I settled on the circuit shown here.

When used as a power supply, the current-limiting IC is switched out of the circuit. The current varies with demand up to the rated capacity. When used as a battery charger, this IC is placed in the circuit and output current is adjusted as needed.

The 2.2k resistor across the output establishes a nominal minimum load of 4 mA. Without this resistor the indicated voltage with no load is higher than the actual voltage applied to a load.

Construction

The construction is straightforward point-to-point wiring. Due to the few components involved, I found no reason to use a circuit board.

You can find most of the components in a well-stocked junk box or purchase them at a nearby Radio Shack. The only items that may cause difficulty are the 10-turn 100-Ohm pot for adjusting current and the rotary switch used for the meter switching. The rotary switch that Radio Shack sells is not suitable with too much contact resistance. The meter shunts will not track with this switch. I used a ceramic wafer switch similar to the type found in HF band switches.

I mounted the two regulators on the back panel of the enclosure, which acts as the heat sink. I mounted them with sockets for convenience. The bridge rectifier also mounts on the back panel.

I used two 8-point tie strips to make all the connections on the secondary side of the transformer. A 5-point strip on the primary side connects the transformer to the line. This strip also supports a ½-amp pigtail fuse.

My enclosure is a home-made aluminum box measuring 6″ x 3-1/2″ x 4″. This is about the right size to house the components with plenty of room on the front for the meter and controls.

The meter shunts shown on the schematic were made from standard value resistors. A .56-Ohm resistor allows a full-scale reading of 150 mA. Parallel .1-Ohm

Parts List

C-1	Cap. Elect. 2200 uF 35 Vdc •
CR1	Rectifier, Bridge 6-amp, 50 PRV. •
D-1	Diode, LED 20 mA.
F-1	Fuse, ½-amp Pigtail type
M-1	Meter, 0–15 Vdc •
R-i	Resistor, 180-Ohm, ½-watt
R-2	Potentiometer, 2.5k (linear taper)
R-3	Potentiometer, 100-Ohm, 2-watt (10-turn preferred)
R-4	Shunt, Meter .056-Ohm (See text)
R-5	Shunt, Meter .57-Ohm (See text)
R-6	Resistor, 15k-Ohm, ½-watt
R-7	Resistor, 1.5k-Ohm, ½-watt
R-8	Resistor, 2.2k-Ohm, ½-watt
S-1	Switch, Toggle SPST •
S-2	Switch, Toggle DPDT •
S-3	Switch, Rotary 2-Pole, 3 or more positions
T-1	Transformer, 18 volt at 2 amps, Center-tapped •
	U-1, 2 IC. Adj. Voltage Regulator (LM-317T) •

Miscellaneous, Suitable Enclosure, Tie Strips, Binding Posts, Line Cord, Knobs, Insulators and Mounting Hardware for U-1 and U-2, Hook-up Wire.

Items marked with "•" are available at Radio Shack. Some items not marked may also be available there.

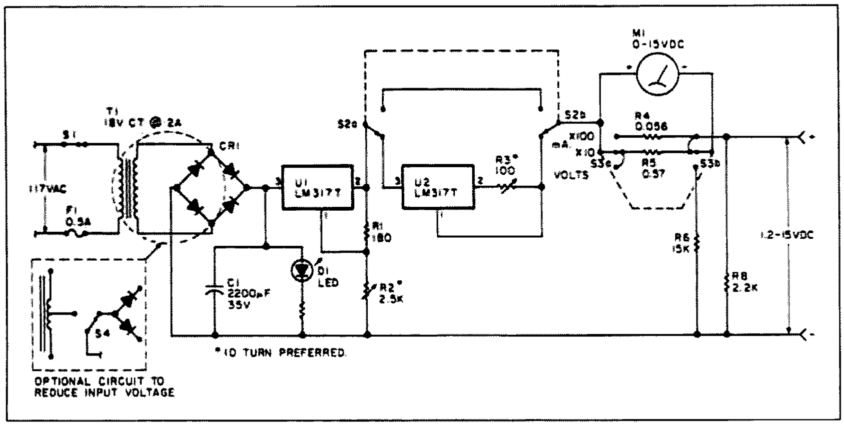

Fig. 1. Schematic for the NiCd battery charger and power supply.

and .13-Ohm resistors provide the .056-Ohm shunt for a 1.5-amp full-scale reading. There is no need for a 15-mA scale, since you cannot adjust the current below 12 mA.

This information applies to a meter with an internal resistance of 85 Ohms, such as the Radio Shack model specified. Meters of other manufacture or range may require the builder to recalculate the shunt values.

When calculating the shunts, you must consider the contact resistance of the meter switch. This is especially true of the shunt for the 1.5-amp full-scale setting.

Calibration

With the components listed, the meter will be within ± 5 percent. Trim the shunts and the multiplier resistor for greater accuracy. You can replace the multiplier resistor with a small variable resistor to calibrate the meter to an exact voltage near the point of greatest use. The shunts are a little harder to trim due to the small resistance required. They may be made with copper wire using a standard wire table to determine size and length. For example, 26.5 inches of #24 wire wrapped around a 100k 1-watt resistor will make the 1.5-amp (X 100 setting) shunt. The 150-mA (X 10 setting) shunt can be 66.25 inches of #30 wire on the same type of resistor. Adding an extra inch to the above lengths initially will allow you to match the shunt to the individual meter. It is also easier to shorten the wire than to lengthen it.

Operation

This unit allows great flexibility when used as a charger. You can select any charge rate up to capacity with the unit in the current-limiting mode. The unit will bring any battery up to full charge without fear of overcharging.

Most battery manufacturers recommend a charge rate to not exceed one-third the amp-hour rating of the battery. This would be considered a fast charge. The normal, or slow charge, is 10% of the amp-hour rating. These correspond to charge times of four and 15 hours, respectively. These figures are for the constant-current charging mode.

Although rarely mentioned in manufacturers' or vendors' literature, NiCd batteries can be charged to a specific voltage. This would be a constant voltage mode. This mode requires some limiting to control the initial current drawn by a discharged battery. The unit really excells in the constant voltage mode.

By setting a voltage limit approximately 10% higher than the nominal voltage of the battery and limiting the initial current to a safe level, the charging process becomes self-governing. A battery left on the charger indefinitely will not suffer any ill effects.

Options

The schematic shows an option that you may wish to incorporate. When the voltage requirement is low—10 volts or less—switching to full-wave center-tap grounded rectification reduces the current dissipated by the regulators, and improves their efficiency. When more than 10 volts are needed, switching to the bridge rectifier mode will supply adequate voltage for proper regulation. Obviously, this option requires a transformer that has a center-tapped secondary. A transformer with a dual-voltage primary, e.g. 110 and 220 volts, could also be adapted to this option.

Another option, although not included, would incorporate an external or internal timer to turn off the unit or reduce the charge to a holding rate. If the unit is to be turned off without disconnecting the battery, the circuit will require a blocking diode. This diode would prevent the battery from discharging through the meter circuit. 73

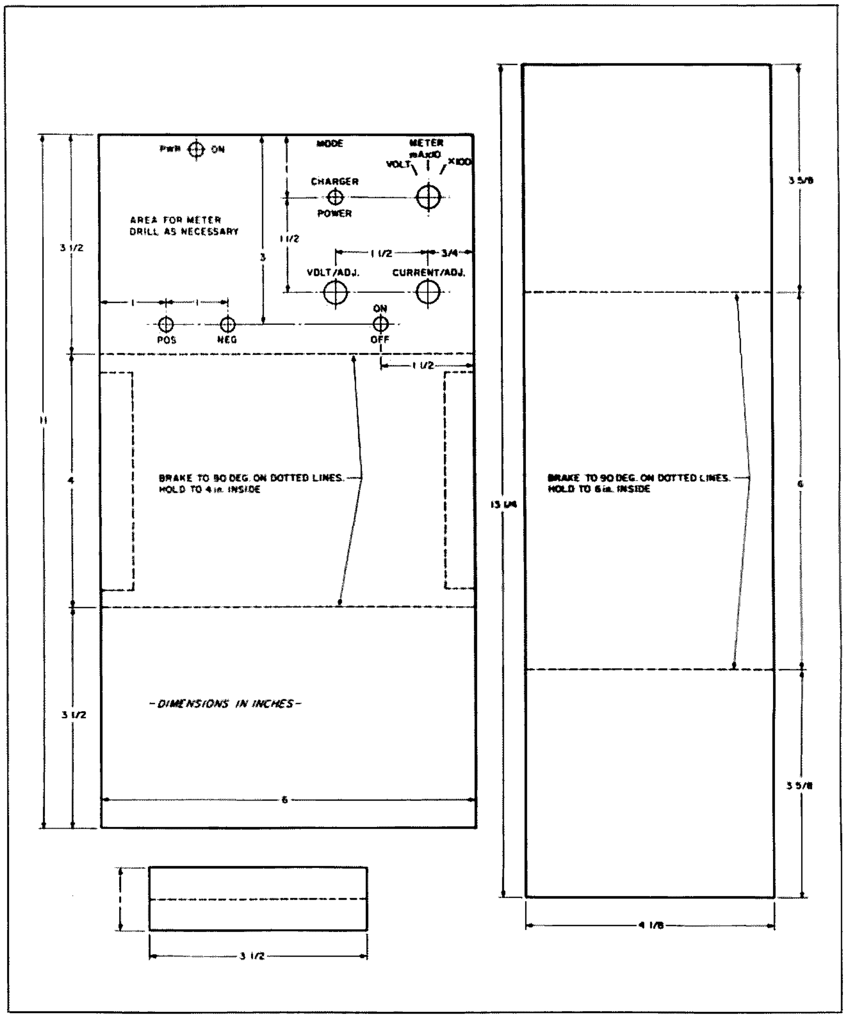

Fig. 2. The chassis template.

Number 30 on your Feedback card

PACKET TALK

Latest in Digital Hamming

Brian Lloyd WB6RQN
19200 Tilford Way
Germantown MD 20874

A NEW FACE

Greetings fellow packeteers! I am deeply committed to the development and growth of packet radio. I hope this column will provide a forum for the discussion of the issues—technical, philosophical, and operational—surrounding packet radio and its future. But I need your help. I need the contribution of your ideas, designs, and projects. If you have used packet radio in a new and unique way, please share your experiences. Don't worry if your experiment seemed to be a failure. We often learn more from failures than from successes! To this end, please feel free to write to me in care of *73 Magazine* or to send electronic mail to me. My PBBS mail address is WB6RQN @WA3PXX. Let's work together for the growth and improvement of amateur packet radio.

The Technical Corner

Recently I received a bulletin from Norm W2JUP. Norm pointed out a basic but critical fact that many of us in the packet community sometimes lose sight of: proper functioning of packet radio requires good, reliable radio links. In order to have effective packet operation, your bits must arrive at the receiving station without errors. Every packet that arrives at its destination is a packet that does not need to be retransmitted.

This translates into better throughput and less channel loading. It seems like a simple and obvious subject, hardly worthy of in-depth discussion. But the fact remains that examination of several packet radio stations using test equipment has demonstrated very strongly that many of us have forgotten the basic lesson taught us by RTTY: there is no substitute for a good solid link and effective modulation/demodulation. You cannot simply take your TNC out of its box, hook it to the mike and speaker leads of your radio, and expect it to work. You are going to have to make sure that your TNC is properly adjusted for the particular radio to which it is connected.

Since the great majority of packet operations take place on the VHF/UHF bands using Bell 202 type modems and NBFM radios we perhaps need to review the basics of this type of operation.

In our standard TNC's the modulator part of the modem accepts digital data (1's and 0's) and uses it to switch between two tones, 1200 Hz and 2200 Hz. The audio spectrum required by this technique spans from about 500 Hz to about 2900 Hz. This conveniently fits within a standard voice-grade telephone line (300-3000 Hz), precisely what Bell intended when they designed the 202 modem. The demodulator discriminates between the two tones and recovers the original digital signal. Simple, huh?

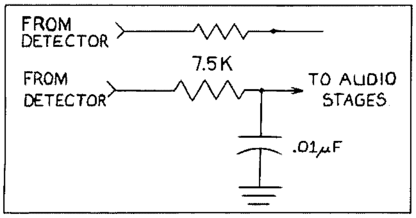

Fig. 1. 75-μs de-emphasis network.

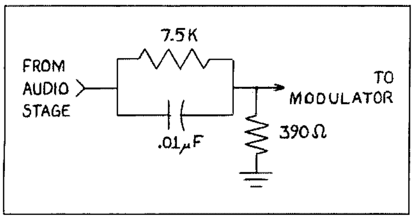

Fig. 2. 75-μs pre-emphasis.

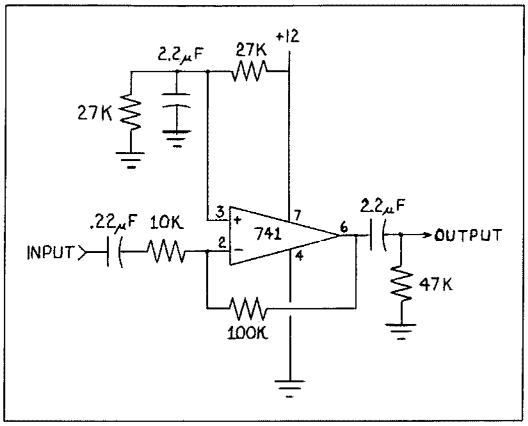

Fig. 3. Buffer amp.

When Bell developed its specification they took the characteristics of the phone line for granted. The phone company specifications say that the telephone line is flat from about 400 Hz to about 2900 Hz with minimal phase shift and at least a 30 db S/N ratio. Now let us examine our 2M FM radios and see how they stack up to the telephone line.

The "official" specification for an FM radio has a bandwidth similar to the standard telephone line. The major difference is that the transmitter is supposed to have 75 microsecond pre-emphasis while the receiver has 75 microsecond de-emphasis. This means that the transmitter should be flat to about 2100 Hz and then boost the high frequencies at a 6 db/octave rate above that. The receiver is supposed to perform the opposite operation, cutting high frequencies above 2100 Hz at a 6db/octave rate. The combined curves should be perfectly flat so that what we end up with is something that is very similar to the ideal phone line (with better signal-to-noise ratio to boot).

If all this were true then we would be seeing bit error rates (BER) of 1 x 10-5 (1 errored bit in 100,000) or better. For the average packet of 128 bytes this works out to about 1 packet in 85 being bad. Since we rarely see this kind of performance, even on a clear channel, there must be some sort of problem. There is. The radios really do not conform to the above specifications and the modem in your TNC tries but fails to correct for this.

The designers of NBFM amateur radios did not even begin to consider that your radio might be used to transmit data. They were concerned with how the radio performed on voice and that it met the FCC specifications for bandwidth and spurious emissions.

The ear is also almost totally insensitive to phase errors. On the other hand a modem is extremely sensitive to these errors. The clipper/limiter and low pass filter in the usual NBFM transmitter's audio stage introduce very large levels of these distortions that are essentially undetectable by ear but which make it almost impossible for the receiving modem to decode the data. That is why a signal that sounds good may not work with your TNC.

Another characteristic of voice radios is that they boost all the high frequencies on transmit and cut them on receive, even more than would occur with a simple 75 μs pre-emphasis/de-emphasis. This works because the energy in the human voice decreases with increasing frequency. Data transmission has a relatively even distribution of energy so such pre-emphasis is detrimental.

Since most of us must make do with voice radios we should set them up so as to give the modem the best possible chance to do its job. Here is a procedure that will extract the best possible performance from the modem in your TNC.

First, decide where to connect the output of the TNC to the transmitter. Many radios have an accessory or CTCSS (PL) input. This input usually enters the chain of audio processing after the limiter and the low-pass filter. If your radio has one of these inputs (sometimes on an accessory jack on the back of the radio but usually on an internal connector) this is where the TNC should be connected. If you connect your TNC here you do not need to worry about the damage to your signal caused by the limiter and the low-pass filter. Command your TNC to generate the high tone (use the calibrate command) and adjust the TNC output level and the deviation control in the radio for 2.5 to 3 KHz deviation.

If your accessory input injects the signal before the limiter/filter or you must put the signal in at the mike jack, you will need to use the following adjustment procedure:

1) Command the TNC to generate a tone (using the calibrate command). Increase the signal level coming from the TNC until the deviation of the radio no longer increases (the limiter is now limiting the signal). Reduce the level from the TNC until the deviation drops to about half of the

maximum level you reached before (don't worry about the amount of deviation at this point). Now go into the radio and adjust the deviation control to give you 2.5 to 3 KHz deviation on the high tone.

As a final check of the transmitter check the deviation of both the high and low tone. The low tone (1200 Hz) should be between 0 db and 3 db less than the level of the high tone (2200 Hz). That means that if the high tone has 3 KHz deviation the low tone should have no more than 3 KHz deviation and no less than 2 KHz deviation.

Measuring Deviation

Setting FM transmitter deviation is a critical item in amateur packet radio, yet most packet enthusiasts ignore the problem. Obviously the easiest way to measure deviation is with a deviation meter. If you are lucky enough to own one, use it. On the other hand a deviation meter is nothing more than a meter attached to the discriminator of an FM receiver. An oscilloscope or meter attached to the discriminator before any de-emphasis network will work well. If you use a meter you will need to provide some sort of buffer amplifier and peak hold circuit between the discriminator and the meter. Such a circuit is described in the *ARRL Radio Amateur's Handbook* in the section on FM.

The big problem is calibrating the meter. If you have a known reference you are in luck. Just adjust your meter to match the reference meter. If you don't have a reference you can use a linear receiver (SSB or CW) to monitor the carrier from the FM transmitter and use the Bessel function characteristics to determine the deviation.

Set up an FM transmitter with a calibrated audio generator as its input. Set the frequency of the audio generator to 2079.2 Hz and its output level to 0. Key the transmitter and tune in the FM carrier with the linear receiver set at its narrowest bandwidth (use a CW filter if you have it). Slowly increase the output from the audio generator and notice that the carrier begins to decrease. At the point where the carrier reaches its lowest level the deviation will be precisely 5 KHz (a further increase in the level of the audio generator will cause the carrier to increase again). Now use this FM signal as a reference for your deviation meter. See the Radio Amateur's Handbook for more details on this method.

Now to the Receiver

Hooking the speaker jack to the input of your TNC may be easy but it is probably not the best way to make the connection. Most radio manufacturers boost the low frequencies in the audio amp to correct for the deficiencies of the cheap little 2-inch speaker they put in. This is fine for your ear but is not what you want for your TNC. The original designers of the TAPR TNC-1 and TNC-2 decided to attack the problem by designing a complementary filter that boosted the high frequencies to counteract this distortion. This works just fine if the response of the input filter in the TNC really does complement the frequency response of the radio (can you say, "fat chance?"). If you have a TNC-1 or TNC-2 clone and want to find out, use a scope to look at the output (pin 1) of the MF-10 filter chip. The two tones should be within ± 2 db of each other.

If this concept of distorting the signal first one way and then distorting it back the other way to fix it seems a bit excessive to you (as it does me) you might want to try a different approach. There is a source of perfectly good undistorted signal waiting to be tapped at the discriminator. Some radios have a center channel meter that reads the discriminator offset—a good place to look for the signal. The hot side of the volume control is usually another good place to tap into this signal.

If you are using a TNC-1 or TNC-2 clone and you wish to use this direct connection you will need to remove the MF-10 filter chip and its associated resistor pack (U17 and U18 in the TNC-2). If you have a TNC-2 clone you now jumper pin 1 to pin 8 on U17 and you are done. You may now connect the discriminator directly to the TNC through the appropriate de-emphasis network (the high and low tones should be within ±2 db at the input to the demodulator in the TNC).

Should you decide to use the discriminator signal be sure that you do not load down the signal too much. The Exar 2211 demodulator used in the TNC-1 and TNC-2 clones will not load the discriminator too much and may be connected directly. If your TNC has a low impedance input network (Kantronics' TNC's come to mind here) you may need a buffer between the discriminator and the modem. Figure 3 shows a good buffer circuit for the discriminator that will happily drive just about any TNC. Build it if you are concerned.

What's the Cost?

You sit down at your terminal, turn on your radio and TNC, and check into the local bulletin board. You receive some mail from a friend across the country and you read it. You compose a reply, send it off, and log off the BBS. Not too bad considering all you had to buy was an inexpensive TNC, huh! Have you ever considered what it cost to get that message to you?

Somewhere out there many people have paid a great deal of money to construct digipeaters, BBS's, and HF gateways in order to deliver your mail to you. If you consider that your local BBS probably consists of a PClone (that's PC+clone), one or two TNC's, and one or two radios, the price was probably between $1200 and $2000 for that BBS that you are using. Have you offered to help out financially to maintain this resource? You say you can't afford to kick in very much money? How about forming a packet radio club to pool your resources!

The result would be a packet community no longer dependent upon the goodwill of a few generous packeteers. It would also provide an advantage for the future when the packet switches that will make up our networks will, more than likely, cost thousands of dollars (much like the good repeaters do today) and thus be beyond the individual means of all but a few of our wealthier brethren. Why not get your packet club together today and start looking toward the future?

And, by the way, when your local BBS goes off the air because its owner needs the computer for something else or he moves away, don't say I didn't warn you.

New Goodies

One of the things that has been holding up packet network development has been the lack of easily available high speed modems (9,600 bps and faster) and the lack of packet switch hardware to take advantage of the fast modems when they arrive. At last both gaps have been filled.

Dale Hetherington, WA4DSY, has designed an elegant 56,000 bps modem. The modem accepts digital data at 56,000 bps in one side and generates RF at 29 MHz on the other. Likewise it accepts RF at 29 MHz and converts it into digital data at 56,000 bps. Why 29 MHz? Because you can readily acquire transverters to put your signal on the desired band. The modems have been tested extensively in Atlanta, Georgia, and work very well!

If you are interested in constructing one (or two) for yourself contact Doug Drye, KD4NC, at P.O. Box 871, Alpharetta, GA, 30239-0871. The three-board set (not a kit—boards and documentation only) costs $75 (please add $5 for shipping). If you can build a TNC-2 you can build one of these modems. You may have to scrounge a bit for the parts, but isn't that part of the satisfaction! The modem uses all commonly available components. Acquiring them should require little more than a visit to your local hamfest and Radio Shack.

But now we need something (besides the KISS TNC—more in a later column) to generate data at 56,000 bps to drive our fast modems.

A group of hams in San Diego have solved that problem. Mike Brock, WB6HHV, Franklin Antonio, N6NKF, and Tom LaFleur, KA6IQA, have constructed a packet switch board called the PS-186. It is powered by an Intel 80186 processor and has up to 256 Kb of ROM and up to 1 Mb of RAM. There are 4 HDLC (read "packet") ports that will each run up to 1 Mbps. That's right! One million bits per second (makes 1200 bps packet seem rather slow, doesn't it). If you populate it with all CMOS parts it requires only 2W of power. Many other design features make it just the thing for mountain tops.

If you are interested in getting one of these boards or just interested in information, send mail to Tom LaFleur at PO Box 9045, La Jolla, CA 92038.

Mark my words. These two pieces of hardware are going to revolutionize the networking aspects of amateur packet radio.

Well that's it for this month. Next month we will spend more time on radios, modems, and what is new on the software horizon. See you then.

Number 21 on your Feedback card

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CIRCUITS

Number 5 on your Feedback card

Great Ideas From Our Readers

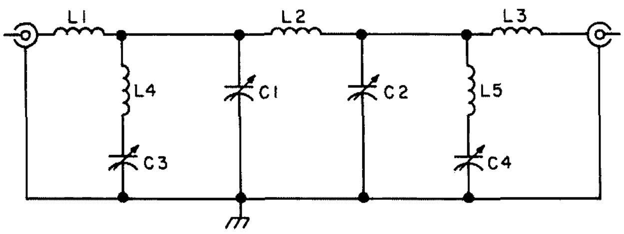
Many readers will recognize the revival of this regular feature, which has been absent from the pages of 73 for several years. We welcome brief contributions of circuits. If your idea is published, you will receive a free subscription or a renewal. Clearly indicate that your submission is for this column and not a manuscript for an article.—Ed.

CHEBYSHEV FOR SIX: *When I recently got back on six meters SSB with a Swan 250, I discovered a number of images, spurs, and other unwanted signals. One of these is handy. It has a stable signal locally on about 50.113 MHz, which can be used like a beacon to judge band conditions from day to day. However, a strong FM station on 89.7 MHz also splatters into the Swan, beating with the second harmonic of the injection frequency. There are two ways to deal with the problem: attenuate the incoming signal or attenuate the oscillator harmonic. The preferred way is to put a filter between the rig and the antenna, because that also attenuates radiation from the transmitter that might cause TVI. What kind of filter?*

A Chebyshev is easy to design, and it can be adjusted without elaborate instruments. Suck-out traps were added to degrade the unwanted incoming signal.

coils, because leads add inductance at these frequencies. I used the familiar APC capacitors (first used in the plug-in coils of the 1930s Hammarlund receivers) but any will do. For good shielding, I built it on the tight-fitting lid of a can that once held Christmas candy. (Tea canisters are also good.) Tune-up requires only a grid dipper or tunnel dipper.

Tune the middle coil (L2) to 55 MHz, using the same capacity setting on each side. Temporarily connect the two trap circuits (C3 L4, C4 L5) as parallel circuits and rough-tune to the frequency you want to reject. (They can be two different frequencies, if desired.) Then connect the trap circuits as series-resonant circuits and solder to the rest of the filter as shown in Figure 1. Insert the device in the line and find the unwanted image. Adjust the trap



L1, L3	3 1/2 TURNS No.14 1/2 in. DIAMETER TRIPLE SPADED
L2	5 TURNS No.14 1/2 in. DIAMETER TRIPLE SPADED
L4, L5	4 TURNS No.14 1/2 in. DIAMETER TRIPLE SPADED
C1, C2	75 TO 100pF APC VARIABLE CAPS
C3, C4	50pF APC VARIABLE CAPS

ALL CAPS WILL TUNE ABOUT HALF-MESHED.

Fig. 1.

I will skip the math, because if you can do that yourself you don't need this article. The coils are oriented 90 degrees apart to reduce mutual inductance. Beyond that, construction is what you find convenient. Keep short leads to the nearest the antenna to reject it. The other trap can be tuned to the same frequency or a slightly different one if there is another station you need to chop out. Enjoy—

Wm. Bruce Cameron WA4UZM,
Temple Terrace, FL.

Parts List for Oscillator

R1	100k, 1/2 watt
R2	33k, 1/2 watt
R3	68k, 1/2 watt
R4	40-Ohm pot (I pulled mine from an old TV convergence board—value of R4 not critical)
IC	NE555
D1–D5	any signal diode (silicon)
Q1	2N2222 or any NPN small signal transistor
C1	.01 ceramic,
C2	4.7 uF, 16V
B+	9-volt battery
	Any loudspeaker

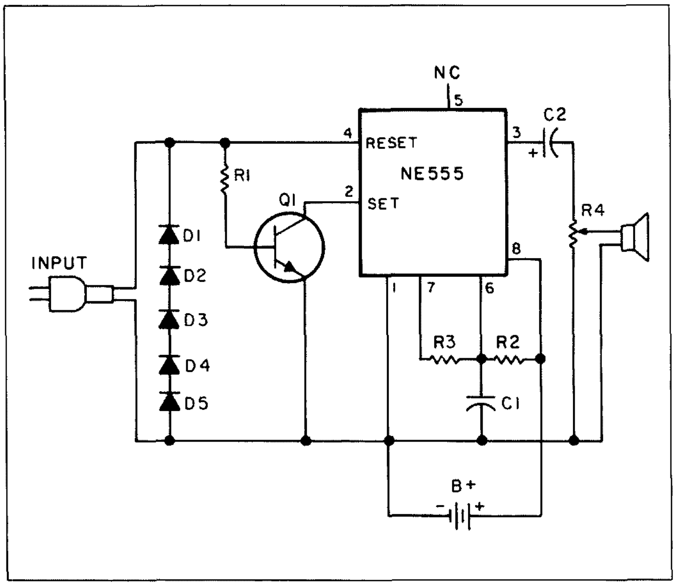


Fig. 2. This circuit will follow any frequency of audio tone.

CLEAR COPY OSCILLATOR CIRCUIT: *I have a Commodore 64 computer I wanted to use in teaching Morse code. But the audio chip in the 64 has a pop when it comes on or goes off a tone. This makes code harder to copy and almost impossible to record for practice or giving tests. I tried many combinations of settings to alter attack, sustain, and decay, but found no settings to eliminate this problem. I decided to make an audio processor to clean up this troublesome noise.*

The circuit design is as follows. The heart of this audio processor is a 555 timer IC.

By feeding the audio tone to the trigger input and the reset input, the 555 can be used as a flip-flop with a huskey buffer and can drive a speaker with enough volume to cover a large auditorium, or can be reduced using either a wire-wound pot or a smaller output capacitor.

The audio input can use either an RCA jack, to use with a monitor cord, or about a three-foot cord with a DIN plug when using a TV set as a monitor. Pin 2 is the high side and Pin 3 is common or ground. The input is shunted with 5 small signal diodes that clip the audio signal to a usable level. I put the anode side of the diode string to common or circuit ground. To get the IC to toggle, it is necessary to invert one input. I used an NPN transistor to invert the signal on Pin 2of the IC. There is a 100k resistor from the audio source to the base, the emitter is grounded, and the collector goes directly to Pin 2, the set input. Audio input goes directly to Pin 4, the reset input.

If you wish to record the output, just hook a 100k resistor to the output side of C2 to a shielded lead to the mike input on your recorder.

—Leonard Bauman, Sr. K9RMN,
Rhinelander, WI.

Number 37 on your Feedback card

WEATHERSATS

View On Video Processing

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SATELLITE IMAGES

Last month I promised some discussion of video processing. Video processing is quite a fascinating and complex subject that will take more than a month to cover, so we had better get started!

Any weather satellite image consists of a range of brightness values represented by a range of subcarrier amplitudes between 4% (black) and 100% (white). No matter what kind of display we use—an analog CRT monitor, a FAX recorder, or a scan converter—we first want to reproduce this range as accurately as possible to display the original image. In practice we rarely achieve a 1:1 correspondence between the original image brightness values and those of our displayed image or print. Without knowing it, we all engage in some degree of image processing. We do so whenever we adjust the brightness and/or contrast of our display system. In most cases we are simply trying to make the picture "look good"—increasing video contrast to bring out more detail in a dark area of an image, reducing contrast to reveal more structure in bright clouds, compensating for display response at the black or white ends of the grayscale, etc.

Assuming a good distribution of brightness values in the original image, such "low-level" video processing is usually adequate for a satisfactory display. WEFAX images, which are already processed by ground computers, fall into the category of "easy-to-display" images with excellent results with simple adjustments of contrast and/or brightness controls. Once you have your display system set up, you can print or display endless WEFAX images and get excellent results. This pleasant situation falls apart, however, when you start to play with polar orbit satellite data! Let's look at an excellent example of the kind of problems we have to face.

A Problem to Consider

Figure 1A shows a hypothetical oscilloscope display of the video detector/filter output with an image from a typical winter daylight pass from one of the TIROS/NOAA polar orbiting spacecraft. For the sake of illustration, let us assume that the detector will deliver a signal ranging from 0V for black to +5V for white, and that the rest of our display system is set up to deliver a good contrast image when driven by signals in this range. Unfortunately, this sample of image data will give us some problems since the first half of the APT line (the visible light data) will reproduce very dark. All the video data are in the low end of the dynamic range, while the IR channel (the second half of the APT line) will probably look pure white.

When you first look at data like this you might wonder why we can't build a satellite that will produce decent pictures! Look at the problems faced by the folks who design these spacecraft. Both the visible and IR sensors in the spacecraft imaging system have a very wide dynamic range. In terms of visible light, the sensors have to be able to provide usable data under brightness conditions ranging from the murk of polar regions in the middle of winter to the brightest cloud illumination at equatorial latitudes. The IR sensors have to provide a usable response over a temperature range that encompasses the Sahara at noon to the polar ice caps in midwinter. They really do accomplish this, as the visible and IR mosaics transmitted by WEFAX demonstrate, but that doesn't help us with *our* display problems! In the case of our NOAA image, all the usable visible light data is crammed at the black end of the grayscale while the IR data are all clustered at the white end of the dynamic range. Since any display system has a finite dynamic range, the result in this case is an overly-dark visible light segment and an overly-bright IR channel with neither providing sufficient detail to be labeled anything close to satisfactory.

An Easy Solution

In the case of the visible light data, we could simply increase the system contrast until we got a satisfactory display—a situation illustrated in Figure 1B. Increasing the contrast has expanded the range of variation in the visible channel to produce a nice display. Although this is an *easy fix*, it is not without its problems. First, without a scope, you would probably have to print or display the image several times until you got it just right. You will also have to readjust the contrast again to display METEOR or WEFAX data.

Finally, the IR data was already quite close to the upper end of the system dynamic range (Figure 1A), and our contrast increase simply raised the system gain enough to clip out all IR variation at the +5V white limit (Figure 1B)! For openers, you might think that a contrast reduction contrast improves the IR display by sliding some of the incoming data down toward the black end of the dynamic range. The results will depend very much on where you live and the season of the year. At low latitudes or at mid-latitudes during the summer you may get a usable display, but mid- and high-latitude stations will not get much in the winter months. There is simply too little subcarrier variation to yield more than a few tantalizing patterns. Figure 1C shows a possible result. The IR data are now well within the 0–5-V range, but "blackest" and "whitest" signal levels differ by very little, so our low-contrast image will be a dingy gray!

Given these problems, we can see why most polar orbit stations use the visible light data, despite the fact that IR data are available during evening passes when most of us are at home!

To avoid constant fiddling with display settings, we must resort to full-blown video processing. In the case we have discussed so far, we want simple *contrast enhancement*. For the visible light data we would like to take the relatively small range of variation near the black end of the dynamic range and expand that to yield a full black to white range on our display. Granted, we can do that with display contrast manipulation, but ideally, we want to simply adjust the display for the best possible display of subcarrier data in the 4% to 100% range and leave it there. Similarly, we want to take the small range of variation at the white end of the IR data range and expand that to increase contrast. Prior to looking in detail at how to accomplish these operations, let's examine some very general requirements and approaches to image processing in general and contrast enhancement in particular.

Analog versus Digital

Most analog display systems, such as CRT monitors and FAX recorders, have no capacity to store image data. They simply accept subcarrier data at the input and transfer it to the CRT trace or FAX paper. Such a system requires "on the fly" adjustments. Real-time processing can be extremely effective, but if the results are unsatisfactory we must print the image again. Without an oscilloscope to aid in level adjustments, replaying and readjusting display recordings can consume a lot of time.

Digital scan converters store the image data in numerical form in a solid-state memory. In such a case, we have the potential to process the image data *after* storage without having to reload the image with each attempt. Not all scan

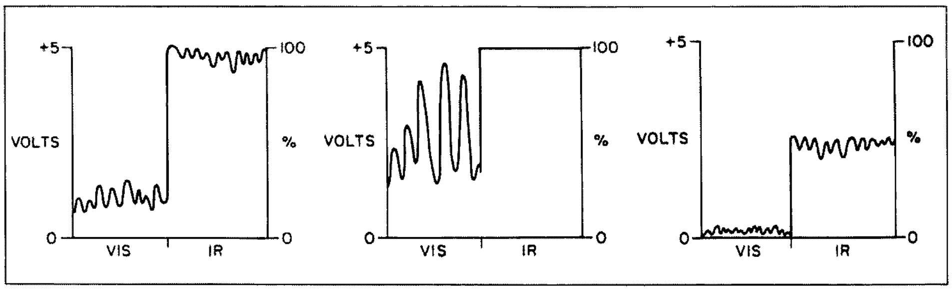

Figure 1. 1A is normal signal output. VIS image is dark and low-contrast. IR image is white and low-contrast. 1B shows increased contrast. VIS has good contrast, but the IR image is clipped white! 1C shows decreased contrast—no VIS image, IR image is gray, and contrast is low.

converters actually have such capability, however. Some scan converters employ dedicated or "hard-wired" designs that do not incorporate internal image processing capabilities. Dedicated scan converters of this type (such as the Wrasse 665) do not allow manipulation of the memory's contents or of changing the numerical value of pixels in their passage from memory to display. So we change the video values at the input. Even some computer-driven scan converters have this problem. The ones in question are those that use minimal bit coding for the data in memory. This will take a bit of explaining, so let's get to it.

Most experimenters will agree that it takes a minimum of 16 grayscale steps (4-bit video) to provide an acceptable TV display. Fewer steps results in a very "digital"-looking image with unacceptable contouring, or a "paint-by-numbers" appearance. Any scan converter that stores pixel data in a 4-bit format (range of 0–15) will have a problem with image enhancement, and this includes the *Weather Satellite Handbook* (*WSH*) and Clay Abrams designs when used with a 64K computer. Both designs store pixels in the same 4-bit format used for display. Let's look at the problems that might occur if we had a picture in which all of the video variation is in the upper 50% of the dynamic range. All of our image data would be in the range of 8–15, resulting in a very washed-out image. As we shall see later, it is no problem to rescale these pixel values so that the original brightness distribution of 8–15 was shifted to a range of 0–15, and we would gain plenty of contrast in the bargain. The problem is that we only had 8 useful steps (8–15) to start. Our new pixel distribution would still have only 8 steps (values of 0, 2, 4, 6, 8, 10, 12, and 14 or 15, depending on how we did the transformation) so that our new image, while possessing full contrast, would be highly contoured and would look pretty bad. The problem gets even worse with greater expansion. With winter IR data, all the 4-bit variation might be in steps 14 and 15. No matter how we "stretched" the contrast, we only have two useful steps available, and the more we stretch the range, the worse the picture will look!

The Solution

The solution is to have more video bits available than we actually need for display. Let's say that the same image data are stored in 6-bit form (64 grayscale steps), but that we are using 4 bits (16 steps) for display. In the case of our first example, with video variation in the upper 50% of the dynamic range, the usable data would all be in the range of 32–63—a total of 32 steps of image data. Since this far exceeds the 16 steps actually used for display, we can stretch or otherwise manipulate the *display* dynamic range without any increase in contouring. In fact, we could expand anything down to 25% of the dynamic range and still retain the normal display! Assuming 4 bits minimum for display, at least 6 bits are required for pixel storage in memory to have any real processing options available without degrading the quality of the displayed image. If your display uses 6 bits, then you should use 8-bit storage (1 byte/pixel) to achieve similar flexibility.

So what do you do if the memory isn't available to allot 6 bits per pixel? One answer is to perform a 6-bit A/D conversion of the video and then convert it to the desired 4-bit format prior to memory storage. That works just fine, but it is an "on the fly" technique with its associated problems. Also, the clock speed on a standard CoCo 1 or 2, for example, will barely permit a 6-bit software A/D conversion and allows precious little time for complex 6- to 4-bit conversion algorithms. One solution would use a fast hardware A/D to leave enough time left for processing. The new CoCo 3, however, will do a 6-bit conversion in half the time as the earlier models with its faster clock. The decreased conversions time also allows plenty of time to manipulate the 6-bit pixel data.

Breaking the 64K memory barrier provides you with lots of new options and flexibility. Use of the 512K CoCo 3 with the Version 4 software for the WSH scan converter allows the storage of 768 lines of image data with 1024 4-bit pixels/line, providing the flexibility for the ultimate in high resolution display via "zoom" routines. The latest software development (Ver. 4.5) incorporates a host of "on the fly" processing routines, which permit image processing while retaining full resolution. Since storage of a 1024 x 768 4-bit image requires 380K of the 512K of available RAM, there is not room for 6-bit pixel storage needed for enhancement routines operating straight from memory. I did write a program that incorporated "from memory" enhancement with the image stored at 512 x 512. While the enhancement flexibility was nice, I did miss the extra resolution. Since I rarely find the need to enhance WEFAX or METEOR imagery, and the enhancements for NOAA are seasonal and generally predictable, "on the fly" conversions lose very little in light of the advantages of full resolution.

In summary, "on the fly" processing *must* be used with analog display systems and some scan converters. Similar approaches may be useful with other scan converters where memory Is limited in terms of the desired level of resolution. "From memory" processing requires ample RAM for video storage. If you want both high resolution *and* the capability to process from memory you will need a lot of *video* RAM. Memory management requirements, which stem from execution of display options, further complicate the situation. The 1025 x 768 storage for the Version 4.X software for the *WSH* scan converter was chosen on the basis of memory management/display option criteria. Storage of 4-bit pixels in this format requires 380K of video RAM. Optimum bit packing for 6-bit pixels at that resolution requires 576K of RAM and lots of software overhead for formatting pixel data. Storing one 6-bit pixel per byte simplifies the software, but that increases RAM requirement to 768K. This translates to elaborate extended memory options for a PC or a class jump to super Macs or AT+ class computers.

How To Do It

In effect, video processing involves purposely distorting image brightness relationships in to get the specific display we need or want. There are many ways to accomplish this, but to keep the discussion manageable I will focus on three basic approaches—analog processing, something I will call "transparent digital processing," and strictly digital techniques. These will take a bit of space to discuss, however, so I defer them until next month.

Picture of the month: The above beauty is a submission from Don Shelley (KD7BU) from Glendale, Arizona. This represents a NOAA 5-pass (visible light data) taken back in May of 1977 using 35mm film and a CRT monitor. The image is superb and shows off that arid western countryside to good advantage. The California coast and Baja California show up beautifully and there is some nice sun-glint off the Pacific south of Baja.

AERIAL VIEW

Antenna News

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SOME THOUGHTS ON MOBILE ANTENNAS

Recently, while loading the car for a vacation trip, my wife commented that my mistress is coming with us. My "mistress" is my radio gear, and in this case "she" was the TS-130 I use when operating HF mobile. My affair with HF mobile, however, involves something of a love-hate relationship—I love to keep schedules with friends on 75 meters as we motor along, but I hate the frustration of trying to maintain those contacts in the face of QRN and QSB. I don't often have difficulties on the receiving end, but it can be tough to make yourself heard when mobile, especially on the 80/75- and 40-m bands. So why do I (and other HF mobilers) sometimes have difficulty making contacts when the same transceiver at home produces solid contacts? The answer lies in the antenna system.

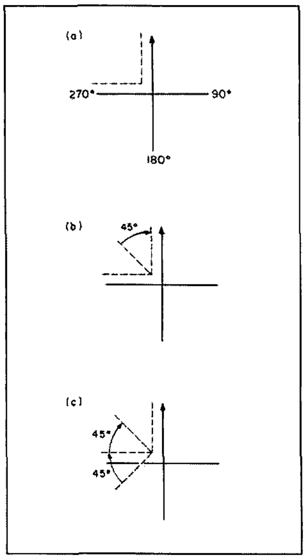


Fig. 1. Orientation of radials added to mobile at rest to maximize received signal strength. All radials were 33 feet long, bare copper, laid on the earth's surface. The near ends were attached to the body of the vehicle to achieve good electrical contact. In all cases, the vehicle faces in the direction of the arrow, with the signal arriving from the left (270°). (a) Two-wire case. Signal strength improvement is 1–2 dB. (b) Three-wire case, with improvement of about 2 dB. (c) Four-wire case, with 3-dB improvement. Numerous combinations were tried. As more wires were added, their orientation became less critical. Depending on antenna placement on the vehicle, other radial patterns may prove more effective for other installations.

The typical home station antenna for the lower HF bands is an inverted vee or horizontal dipole constructed of wire. The efficiency of such an antenna is typically 98% or better; i.e. 100 watts in, 98-plus watts radiated. A typical 75-m mobile employes a whip 8 to 9 feet long and a coil for loading it to resonance. Make a guess about its efficiency. 50%? 30%? 10%? Try 3–5%. That means for every 100 watts of output from your tranceiver, fewer than 5 watts are actually radiated. The other 95 watts dissipate as heat. No wonder that mobile signal is "wimpy, wimpy, wimpy."

Why is a mobile antenna so inefficient, and what can we do about it? If you hadn't guessed it by now, that's what this month's column is about.

Just a Little Theory

I'll discuss some practical ways to improve mobile antenna efficiency a little later on, but first we should understand why the efficiency of these antennas is so low.

We all know that resistors absorb power. Antennas have a characteristic known as "radiation resistance." Power "dissipated" in the radiation resistance, R_R, is the power radiated. Antenna systems have other resistances associated with them, including the resistance present in the ground, R_G, and the resistance due to any loading coils, R_C. The total resistance, R_T, can be expressed as:

$$R_T = R_R + R_G + R_C \quad (1)$$

The power applied to the antenna is divided among these various resistances, so you can see that having a low radiation resistance in the face of high R_G or R_C makes for a poor radiator. In fact, we can define

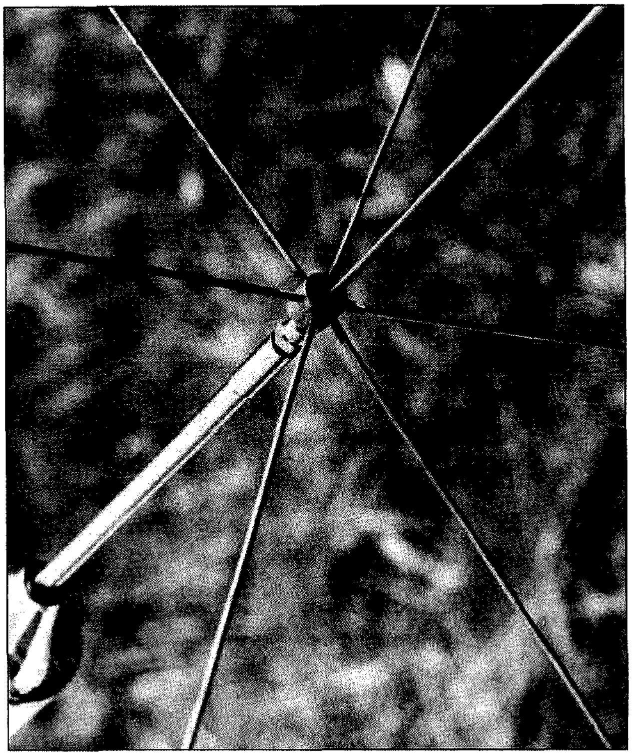


Photo A. Close-up view of a top-hat, approximately 2 feet in diameter. It is fashioned from 6 stainless steel bicycle spokes and a piece of scrap aluminum. Spoke threads are 2-56. (Not all spokes are that size!) Set screws in the aluminum collar hold the top hat in place.

the percent efficiency, n, of the antenna as:

$$n = R_R/R_T \times 100 \quad (2)$$

I won't give you the equations that allow you to calculate the radiation resistance of a given antenna here. Suffice it to say that for short vertical whips, R_R is proportional to the square of the antenna's length. (1, 9)

We have a number of theoretical terms floating around now, so on to a concrete example. Let's

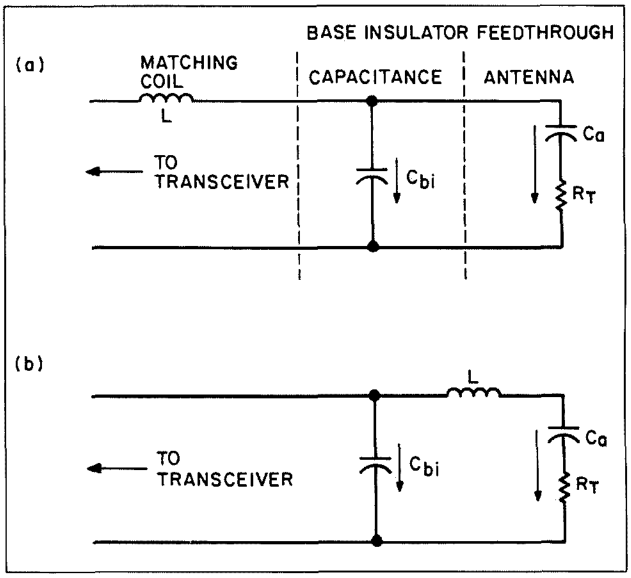


Fig. 2. Less desirable (a) and preferred (b) methods of positioning base-loading coil. When L is placed inside a metal vehicle (a), significant non-radiating current can flow through the base insulator feedthrough capacitance, C_{bi}. (From Belrose, Ref. 1).

assume our antenna is 8-feet long, center-loaded, and that we'll operate at 3.8 MHz. R_R for this antenna is about 0.8 Ohms. A typical value for R_G at this frequency is 10 Ohms. The resistance of the coil to produce resonance will vary with its quality (Q). A good coil (Q = 300) for this antenna would have a resistance of about 12 Ohms, (1, 9) while a coil of lesser quality (Q = 50) might have a resistance of 70 Ohms. (9) Putting the above values into equation (2),

$$n_1 = 0.8/(0.8 + 10 + 12) \times 100$$
$$n_1 = 3.5\%$$
$$n_2 = 0.8/(0.8 + 10 + 70) \times 100$$
$$n_2 = 1.0\%$$

where n_1 = the efficiency of the antenna with the low-loss coil, and n_2 = antenna efficiency with the higher-loss coil. You can see that the power out from the lower-loss system is up 5.4 dB. Now you know why some of us drive around with "oversize" resonator coils, even though we are only running 100-W! Typical efficiencies for a base-loaded 102-inch whip antenna appear in Table 1. (Table 1 also contains inductance values that will allow you to make an inexpensive amateur mobile antenna from a 102" CB whip).

Play a little with equation 2 and your calculator and you'll realize why mobile antennas can be so inefficient in the lower HF range. It's not that the radiation resistance is low, but rather that R_R is low in relation to the other losses—R_G and R_C. To increase the amount of signal radiated, we can: 1) add an amplifier; 2) increase R_R; 3) decrease R_G; 4) decrease R_C; 5) some combination of the preceeding four. I'll leave it to you to deal with an amplifier, while I'll discuss the other avenues of approach.

Increase R_R

As I mentioned earlier, R_R increases with the square of the antenna length. If we increase the length of the whip in the example above from 96" (8') to 144" (12'), R_R will increase from 0.8 Ohms to 1.9 Ohms. If we keep other losses constant, the efficiency would rise from the 3.5% given above to nearly 8%. The antenna still radiates only 8 out of every 100 watts, but that's 2.6 times, or 4.15 dB, better than before. Actually, the increase in efficiency would be even greater, since the longer antenna would require a smaller loading coil (lower R_C). The wrench in the works: keeping a

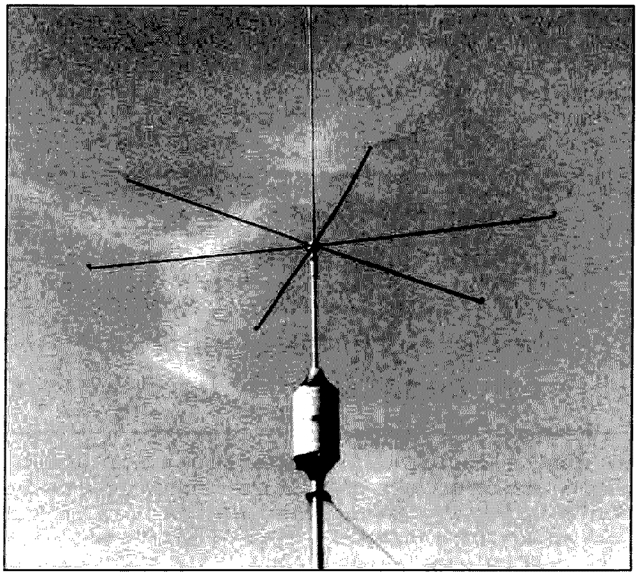


Photo B. A Hustler 20-m resonator with a top hat two feet in diameter. The system resonates in the 30-m band.

12-feetlong antenna attached to your vehicle at freeway speeds. You'll also have to figure out how to negotiate the low power lines and trees along your local streets, and to be legal in this part of the country you have to keep the maximum vehicle height below 14 feet. If you want to build an efficient mobile antenna (and antennas such as this are roaming the highways), this is one approach to consider.

If the mechanical problems associated with a long whip seem too formidable, or if you want to stick with commercially-made antennas when going mobile, you can still increase R_R, and thus the efficiency of your system. Pull off to the side of the road, remove that resonator, and attach enough wire to the remaining mast so that you have a full quarter-wave on the frequency of interest. R_R is now approximately 35 Ohms, while R_C has disappeared. The efficiency may climb to 75% if you find a high end support. There will be less, although still worthwhile, improvement, if the antenna runs more horizontally. I have used this approach with good success. You can even use multi-conductor cable, such as rotor control cable, to make "parallel monopoles" for multi-band operation. True, it's not strictly a mobile antenna, but if you can arrange your schedules to coincide with your rest stops, or vice versa, it can mean the difference between a solid contact and being told you're +"20 under."

What if you pull into a rest stop and find no room to string the wire? I know of a W6 who uses a mobile antenna that can be retracted for use on the highway, or considerably extended for improved operation when at rest. I have replaced the resonator (only) of my Hustler antenna with a 102-inch CB whip (Photo A).

f(MHz)	1.8	3.8	7.2	10.125	14.2	21.25	24.95
R_R (Ω)	0.11	0.47	1.7	3.5	7.3	19.1	29
LoadingL (μH)	273	61	16	7.7	3.4	0.9	0.3
R_CΩ (Q = 50)	61	29	14	9	6	2.4	2
R_CΩ (Q = 300)	10	5	2.4	1.5	1.0	0.4	0.3
Q = 50	0.2	1.2	6.6	17	40	85	91
Q = 300	0.5	3.0	12	27	55	93	96

Table 1. Approximate values for a 102-inch mobile whip with base-loading and average diameter of 3.16 inch (equivalent to a CB whip).

The addition of a top hat two feet in diameter (photo B) makes this antenna resonate in the 20-m band with no need for a loading coil. Mechanically, this arrangement leaves something to be desired, but received signals are 5 to 10 dB better than with the stock Hustler. So it is not without potential.

Reducing R_G

As long as you are moving, you have little control of ground losses. However, you can increase the efficiency of a mobile antenna at rest by laying out ground wires attached to the vehicle's frame. Since only a few radials are used, they need not be a full ¼ wavelength long—I have used 33-feet long (⅛ wavelength) radials while operating on 75 meters with good results. Some people (1) have reported significant (10 dB) increases in transmitted signal strength with a single radial laid out in the direction of propagation. I have not noticed an improvement when using a single radial in that manner (frequency of 3.8 MHz, radial length 66', stock Hustler 75-m antenna, car parked in a wheat field). However, I did note a small (1 to 2 dB) increase in received signal strength when I added a second wire, and a 3-dB improvement when I used four radials. The maximum benefit requires proper orientation of the radials—see figure 1. I would expect greater improvement with the use of radials when parked over ground of less conductivity than the farmland I used when I did these tests.

Reducing R_C

If you aren't quite convinced that the loading coil on your expensive commercial mobile antenna can actually dissipate over half of your transmitter's output power as heat, give a long transmission sometime and then step outside and feel how warm the coil is. Or you could do as an acquaintance of mine (who shall remain nameless) did and apply the output of a kilowatt amplifier to your low-power resonator and watch the coil catch fire. A low-loss coil is a high-Q coil and will be wound of large diameter wire on a low-loss form with a relatively large diameter-to-length ratio. Such a coil is not difficult to make on the bench, but incorporating it into a mobile antenna system while maintaining structural integrity is not so easy.

You can compare the quality of

coils you wind yourself against one another or with commercial versions by noting the antenna SWR at resonance, with no matching devices in place. If two coils each resonate the antenna at 3800 kHz, for instance, the coil that produces the highest SWR will be the most efficient one. (9) How can that be? Look again at equation 1. In this case only the coil (R_C) is being changed, so R_R and R_G are constant. Decreasing the value of R_C causes R_T to decrease, and so the SWR rises. Recall that SWR is proportional to Z_O/R_T, where Z_O is the impedance of the feedline. At home or mobile, whenever you have a simple monopole with a low SWR over a wide frequency range, suspect high losses in the loading coil, ground system, or both.

If you shy away from winding your own coils, there's still hope for reducing R_C losses while using commercial resonator coils. You can use a coil for a higher band by adding a capacitive top hat and increasing the length of the whip above the resonator. Photo C shows how I could resonate a Hustler 20-m resonator on the 30-m band by the use of such a top hat. From time to time, I attempt to resonate my 40-m system in the 75-m phone band by adding a large top hat and increasing the length of the whip above the resonator, but I have yet to come up with a combination that is a satisfactory compromise between mechanical stability and downright ugliness. Such an arrangement should give a worthwhile improvement when compared with the standard 75-m system, however, since R_R is increased by the increased antenna length, while R_C is decreased due to the smaller size of the loading coil.

"Whenever you have a simple monopole with a low SWR over a wide frequency range, suspect high losses in the loading coil, ground system, or both."

Regarding top hats: If they are placed too near the loading coil, they can actually increase coil losses. (9) As I discussed above, increased losses can mean lower antenna system SWR due to decreased efficiency, which is the opposite of what you want.

Speaking of matching, if your antenna uses base loading, install the loading coil on the outside of the vehicle. (1) With the coil installed inside the car, a significant, non-radiating, current can flow through the capacitance (typically 3–15 pF) of the feedthrough insulator. When the coil is located outside the vehicle, the feedthrough capacitance is unimportant. See Figure 2. Also, you should avoid the combination of bumper-mounting and base-loading if it places the loading coil in close proximity to the car's metal body.

Another method to decrease the amount of inductance, and hence R_C, for a given length of antenna is to increase the antenna's diameter. For example, a 102-inch whip with a diameter of 3.16" requires about 61 µH to resonate it on 3.8 MHz when base-loaded. An antenna of the same length but of 1½" diameter will resonate on the same frequency with only 37 µH of inductance. The formula for making these calculations (for base-loaded antennas) is:

$$L(\mu H) = 60\left(\ln\frac{h}{a} - 1\right)(\cot G)/2\pi f \quad (3)$$

Where: h = height of antenna in inches
a = diameter of antenna in inches
G = electrical height of antenna in degrees
f = frequency in MHz

Combinations and Other Possibilities

As I hope you have gathered by now, mobile antenna systems for lower HF bands leave a lot of room for improvement. Achieving marked improvement over compact commercial antennas is mainly limited by structural considerations and your willingness to appreciate the "functional beauty" of your creation in the face of comments from family members and stares from passersby. If you are really adventuresome, you might like to try a loop antenna—these have been described for mobile use in both the professional (2) and amateur (5, 6, 7) literature, and can outperform vertical whips. If you have the time to pull off to the side of the road, lay out a few radials, and extend or otherwise modify the mobile antenna temporarily, you can boost your signal strength more than if you had switched on an amplifier. Another possibilty is a temporary mast-mount on a metal plate. You can construct a portable mast from inexpensive TV antenna mast section five feet long, and use it to support a wire dipole. The base plate is held secure by the weight of the vehicle. Signal strength improvement relative to common mobile whip is likely to exceed that due to adding an amplifier, also works on receive, and costs much less. To erect this system, just pull to a stop, drive a wheel up onto one end of the plate, put a few telescoping sections of tubing together, and you have a support for a dipole/inverted-vee that even at 15 feet will outperform most verticals in that situation.

Here are some ideas to start with. Check the references for some more, especially Belrose (1) for information on calculating R_{RV} and necessary matching inductance for base-, center-, and helically-loaded antennas. 73

References

1. Belrose, J., "VLF, LF, and MF antennas," Handbook for Antenna Design, Vol. 2, eds. Rudge, Milne, Oliver, Knight, published by Peter Peregrinus Ltd., London, 1983, pp. 559–633.
2. Burberry, R. A., "HF loop antennas for air, land, and sea mobiles," Second Conference on HF Communication Systems and Techniques, IEE, London, 1982, pp. 18–22.
3. Cloninger, W., Jr., "Four bands, one whip," 73 Magazine, April 1984.
4. Ewing, G., "Mobile Antenna Ingenuity," 73 Magazine, Feb. 1979.
5. Mitchell, "Loop-type antenna for 75-m mobile," QST, Feb. 1951.
6. Taylor, J. E., "The 'Mobiloop,'" QST, Nov. 1968.
7. Webster, "Mobile loop antenna," QST, June 1954.
8. "Four band mobile antenna," 73 Magazine, Jan. 1981.
9. *ARRL Handbook*, 1987, pp. 33-15 to 33-17.

Number 20 on your Feedback card

ATV

Ham Television

Mike Stone WB0QCD
PO Box H
Lowden IA 52255

WB8ELK OHIO ATV BALLOON RECOVERED!

The WB8ELK helium-filled balloon carrying Fast Scan TV launched from Findlay, Ohio, August 15th has been recovered with its video package intact. A farmer harvesting his crops not far from the launch point discovered the balloon. The $500 airborne ATV platform went out of sight at 100,000 feet after sending some great computerized ATV pictures at 439.25 MHz on UHF over a reported QSL distance of more than 400 miles. Hams in eight states reported reception of the signals. The balloon was lost and presumed down somewhere within a 50-mile radius, or possibly even caught in the jet stream and headed for the East Coast.

Bill Brown WB8ELK called me the other night on 3.990 MHz, over-joyous to report that the balloon and its package were found. When the farmer stopped harvesting the corn late one night, he parked the tractor where it stood and went back to his house. The next morning at daylight, he was back at it again, and noticed a white styroform package laying just a couple feet from his combine in the path of the harvester about to be gobbled up! He stopped at just the right time late the night before! Bill and the Findlay, Ohio, ATV gang had a return address and reward designator on the package in case someone did recover the balloon, and it really paid off. Bill ran tests on most of the electronic components, and all looked okay. His event report can be found in the September/October issue, Volume 17 Number 8 issue of The Spec-Com Journal.

This was a happy ending to the midwest's most exciting 1987 summer event. Some 100 ATV enthusiasts checked in on the 40/80 meter ATV nets, and another estimated 300-400 hams watched for the signals. Signals made it all the way to New York (W2RPO) and to the west with KB9FO and K9MTE at P3 levels and N9AB at P2. The CW ID'er was heard in St. Louis, Moline (N9AEP), Baltimore (N3AGG) and elsewhere. It was quite a day, and hopefully you were there to participate! This was certainly yet another great innovation for the use of the ATV mode. Bill and his crew plan a similar launch in the spring of 1988. Bill states special thanks to NR8Q, WA8GAU, WA8VWY (followed the balloon by aircraft!), WB8MSJ, KA8LWR, W8VKR, WA8HDX, N8DOO, KA8WLV, W8RSK, WA3USG, the Iowa BRATS ATV GROUP, The Spec-Com Journal and W6ORG of P.C. ELectronics.

New 40/80 Meter FSTV Net Frequencies!

One of the neat things to come out of the WB8ELK FSTV balloon project was the incredible amount of people that came on regularly on 40 and 80 meters. I used to sponsor and help W9ZIH conduct a regular Saturday net on 7.290 MHz a few years ago. We had 20-40 regular participants, but it died as 40 meters did for the summer. I never got it restarted. A successful net needs committment including regular participation and assigned net controllers. Bill WB8ELK in Findlay, Dave WB0ZJP in St. Louis, Henry KB9FO in Chicago and I have been giving some serious thought to start the HF ATV nets and "talk spot" frequencies going again! So, here is our offical 73 magazine notification. The nets will meet on 7.230 and 3.860 MHz. These frequecies have already been mentioned in The USATVS Journal classified ad section. Fast Scanners have already started to coordinate DX contacts during band openings and just friendly HAM-TV chitchat since early October.

The frequencies may change ± 5 kHz, depending on band conditions and QRM. If someone would like to get an international or net going on twenty meters, we need volunteer net controllers. These forty- and eighty-meter frequencies will become the spots to listen and talk to other regional ATV enthusiasts. They will most likely be around early in the morings between 6 and 9 AM for any DX band enhancements (while transmitting FSTV signals east and west on UHF), and on weekends on Saturday and Sunday. WB8ELK, WB0ZJP, KB9FO and WB0QCD have consented to take net controller positions on Sunday mornings at 0800 AM (Central time). We need your participation!

Check in and keep up with the latest news going on in HAM-TV! You active Fast Scanners pass the word about these frequencies to others, OK? Route any HAM-TV related PACKET RADIO messages to WB8ELK via N8ET PBBS in Ohio or to me WB0QCD via WA0RJT PBBS in Cedar Rapids, Iowa. We will answer them. By the way, the September/October issue of SPEC-COM also listed 421 W0RLI PBBS systems, if you need to figure out the best routings to your packet buddy. (Sample copy available for $2.50 ppd. Specify this particular issue.) The frequencies list above, may not be cast in stone (pardon the pun).

I picked them mainly to give those who have general class licenses a chance to participate. It's a good place to start. Now just don't sit there and listen to the static when looking for ATVers on 40 or 80 meters. Tune up that dummy load and put out several calls our way, OK? An intercontinental ATV net frequency? How about 14.240 MHz just above the SSTV calling and operating area? You call it, and I'll publish it!

"If it sounds like I am depressed about SSTV, I am."

Lack Of SSTV Information

The mail here at 73 has been running far ahead for FSTV comments over SSTV ones. That isn't surprising. SSTV never has had available a monumental wealth of technical information. There are very few builders in SSTV anymore, mostly "appliance operators" like myself. Buy it and hook up a camera. I have had 3 ROBOT 400's, 3 German WRAASE converters (SC-421 and 422 and SC1), 2 ROBOT 1200C's and a

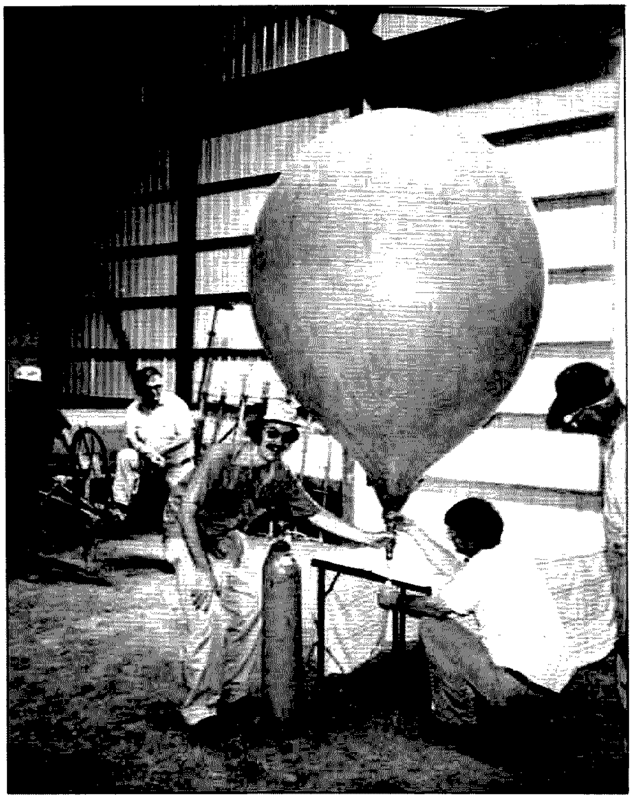


Photo A. Bill Brown WB8ELK and the rest of the Findlay, Ohio, ATV group prepare their helium balloon and FSTV package for launch. Hams in eight states reported signals from the balloon.

host of "interfaceless" low-resolution, computer SSTV programs for the TRS80C CoCo, the C64 Commodore and the IBM PC Clone (Tandy 640K 1000SX). Every once in awhile I get enthused about SSTV, get on-the-air, then listen to the bunch of malarky from several self-esteemed operators on how great they think they are. I get turned off and get involved in something else. Recently I had been off the air on SSTV for about 6 months. I put AC to the 1200C, tuned up on 14.230 MHz and the first thing I heard was a chap out east still pushing for dues the dead IVCA Club to those newcomers who unfortunately checked into their net. Some things never change. If it sounds like I am depressed about SSTV, I am. It seems to be going nowhere.

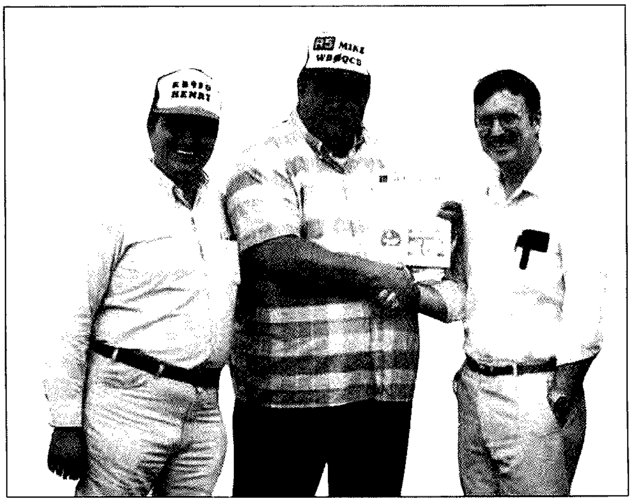


Photo B. Henry Ruh KB9FO and Mike Stone WB0OCD show off with Dr. Tony England W0ORE at the Peoria, Illinois, Superfest in September. Dr. England sent SSTV pictures from Space Shuttle Mission 51H more than two years ago.

Yes, the color and high resolution is great. I marvel at most of the pictures being sent. But how often do you see a live shot? You know, a mug shot? Hardly ever. "Here comes a (illegal) picture that I just snatched of the TV, Bill, 5-4-3-2-1," says one SSTVer. You see, I have a 525 line, NTSC, excellent resolution picture already in my shack of that sent SSTV frame. Why am I suppose to get a kick out of seeing it again—even at half-resolution across the country? SSTV today lacks originality. Originality might make up for the lack of technical experimentation that SSTV endures today. To me, it's more fun looking for those new guys who just picked up a ROBOT 400 black/white converter for $100 at the local hamfest. They appreciate live pictures. OK, I'll grant you that a national column editor about ATV (all modes of HAM-TV) shouldn't be so depressed about one of the represented modes.

So impress me! How about some of you out there taking pens in hand and submitting some material to publish in 73 or SPEC-COM? Fred Sharp W8ASF in Cleveland has regular monthly allotted space for SSTV, yet he gets little response. I would be glad to devote more SSTV comments, articles and pictures to this column each month. Send some material, please! Otherwise read about all the neat things going on in Fast Scan TV.

"Please go back through your SSTV tapes, snatch a good color or black and white shuttle picture, and reprocess it onto a new tape."

SSTV Shuttle Tape Request by W0ORE

Where did everyone go after Tony and crew flew the Challenger into SSTV history? 14.230 is once again smothered to death with the power hungry, DXers and their 5 by 9 reports on what else but prearranged "telephone lists." Speaking of NASA's Tony England W0ORE, I had a chance to meet and talk with him at the Peoria Superfest on September 19th and 20th. Surprisingly, he has seen very little of the captured SSTV pictures sent to all of us here on earth.

I asked Tony if he would like an assembled cassette of many SSTV pictures sent to all of us here on earth. I asked Tony if he would like an assembled cassette of many SSTV pictures from space and he said that it would be very nice. In the November issue of SPEC-COM, we announced a call for Mission 51H Space Shuttle SSTV pictures sent to earth from one of the last flight of the Challenger. Please go back through your SSTV tapes, snatch a good color or black and white shuttle picture and reprocess it onto a new tape. Document time, date, location of shuttle and orbit if possible. Send it to us. We will transfer and combine these captured pictures into one C30 or C60 tape package and present it to Tony probably at Dayton. Your submitted pictures will be accredited. I can't promise, but Tony had extra 8 x 10 color photos of himself at Peoria that he would probably be willing to part with.

If I can't get any from NASA, Tony or Lou W5DID at JSC ARC, then I'll ask Wayne Green for a few of his before he lost weight. You're right. Since he is running for Vice-President, Wayne probably got rid of all of those ones for the new, thinner prints. NOTE: Send along an extra blank tape, and I will make a copy of the final version for you at no charge! There is one catch though...don't be in a hurry to get them back. This project will no doubt take months to complete. So be patient and the tape will find it's way back to your mailbox sometime in 1988. OK? I knew I could count on you. Tony says thanks too!

More Questions and Answers!

We got a lot of response the last time we did a Question and Answer session about HAM-TV. So here goes another one.

Question: I am new to FSTV on UHF. What type of coax should I use? I have a friend who has some 75 Ohm CATV stuff, ½ inch I think - is that OK?

Answer: Free is free, I guess, and you get what you pay for. If that is the best you can afford, then use it. The 70-75 ohm impedance mismatch isn't too bad for receive only. However, if you can afford to get a chunk of Belden 8214 or preferably 9913 (or an equivalent like Columbia 1180) then do it. There is a tremendous amount of loss on UHF through connectors, the coaxial transmission line, etc. Do it wrong, and you'll pay for it on the other end!

Question: Should I use vertical or horizontal polarization on my ATV antenna?

Answer: Look around you (out to several hundred miles) and see what polarization others in your area use. Which way you go makes little performance difference. Getting the right polarization for the operators in your area IS important. The wrong polarization can lose 20 dB of signal strength! Find the other operators on two meters, or take a look at the FSTV antenna polarization map in The North American FSTV Guide Booklet ($5.95).

Question: Color has always been a problem passing through our ATV Repeater. Yet, our color bar display from the remote transmitter works just fine on our 426.25 MHz output. What gives?

Answer: It is tough to troubleshoot by letter. Check your repeater's TV set or TV demodulator processor board. This is the circuit that takes an incoming signal, processes it and sends it out again in video form. At our system in Davenport, we passed color in what we called MODE-A (remote transmitter) position but passed poor color on none at all in the MODE-B Fast Scan TV Repeater. I set up an independent, known, good color TV set and a receive downconverter and began adjusting the pots in our Motorola Quasar VCR tuner TV receiver board and brought nearly 3 years worth of frustration to an end! My other electronic companion buddy was always afraid to mess with it since we didn't have much information about the unit. I got brave and lucky. We now pass great color and audio subcarrier sound. Experiment intelligently. That is what the hobby is all about. 73's until next column, gang! de Mike WB0QCD.

Number 36 on your Feedback card

SPECIAL EVENTS

Ham Doings Across the Country

Special Events listings will be provided by 73 magazine free of charge on a space-available basis. Announcements must be received by us by the first of the month, two months prior to the month in which the event takes place (by March 1, for example, for a May or later event). Please mail to Editorial Offices, 73 Magazine, WGE Center, Peterborough NH 03458.

BETHLEHEM CT
DEC 1–31

For the whole month of December the Hen House Gang Amateur Radio Club will be holding the Bethlehem Christmas Special. All ages welcome. And the frequencies will be on 10–80 meters and Novice on 40 CW. For more information send a first class stamp (only) to *W1FHP, Hard Hill Road, Bethlehem CT 06751.*

FARIBAULT MN
DEC 5

The Annual Handi-Ham Winter Hamfest will be held Saturday, December 5, 1987, at the Eagles Club in Faribault, Minnesota starting with registration at 9 AM. There will be a Handi-Ham Equipment Auction, dinner at noon and a program. Amateur radio license exams will also be given. Talk in on 19/79. For more information contact *Don Franz W0FIT, 1114 Frank Avenue, Albert Lea MN 56007.*

APACHE JUNCTION AZ
DEC 5–6

You are cordially invited to spend a weekend in Apache Junction Arizona on the weekend of December 5–6, 1987, at SUPERSTITION HAMFEST 87, sponsored by the Superstition Amater Radio Club. There will be free camping on the grounds Friday and Saturday nights (self-contained), with swap and shop opening at 7 AM Saturday and closing at 2 PM Sunday. A test booth with 120 VAC and antennas will be available for testing of gear before purchase. The Hamfest is located on the rodeo grounds at the NW corner of Brown Road and Meridian, 1½ miles north of US 60 on the west side of Apache Junction. Primary Talk-in is 147.12 RPT and 223.5 mHz simplex. Other area repeaters include 146.72, 146.74, 145.41, 146.94, 223.82 and 224.94 MHz. For more information contact *Superstition Amateur Radio Club, Inc., P.O. Box 1551, Apache Junction AZ 85217-1551 (602/986-2298–ask for Larry).*

NEWCASTLE DE
DEC 5–6

The First State ARC will operate special event station, K200QBD from The Old State Capitol in Newcastle, Delaware, on December 5–6 in celebration of the 200th anniversary of Delaware's signing of the Declaration of Independence. Look on the 80-15 meter bands and the 25 kHz ± QRM up from the lower end of General phone bands and the 10 meter Novice phone band. For certificate send QSL and large SASE to *FSARC, P.O. Box 1050, Newark DE 19720.*

MILFORD MI
DEC 6

The Hazel Park Amateur Radio Club will hold its 22nd Annual Swap and Shop on December 6, 1987, at the Hazel Park High School, 23400 Hughes. General admission is $2 advance, $3 at the door. Children under 11 years are free. Plenty of free parking. Talk-in from the 9-mile and I-75 area on 146.52 simplex. For tickets and table reservations, mail to *H.P.A.R.C., P.O. Box 368, Hazel Park MI 48030.*

ATHENS OH
DEC 12–13

The Athens County Amateur Radio Association will operate special event station, WD8OXX, on December 12th and the 13th, to celebrate the 200th anniversary of the Northwest Ordinance from the home of Ohio University, first public university in the territory. Operation from 1500Z till 2300Z each day. Suggested frequencies: lower portions of the General 80, 40, 20, 15 and 6-meter bands. Novice phone: ± 28.400. For certificate, send QSL and large SASE to: *Jeffrey White WD8OXK, P.O. Box 73, Athens OH 45701-0073.*

QRP

Number 33 on your Feedback card

Low Power Operation

Mike Bryce WB8VGE
2225 Mayflower NW
Massillon OH 44646

VFO FOR THE 6L6

I'm still going over all the letters that the 6L6 Special generated. With a bit of luck, I'll have the update ready for next month. However, a letter from Wayne Sandford, Jr. K3EO caught my eye. Wayne wrote to say he built a VFO for the little one-tuber since he never liked crystals. I wrote back to Wayne asking him for a copy of his VFO schematic. Figures 1–3 illustrate his project.

Now, there are VFOs and then there are VFOs. Wayne's version is something special. The heart of his circuit is a Collins Type 70 H-13 PTO. This is what gives his VFO that rock-solid tone. Wayne writes, "This PTO is small—about 1" by 3" by 5". I removed the two miniature tubes and substituted MPF-102 transistors. The PTO has a thermostat and heater, which are left on all the time. Extensive tests with a good frequency counter show that the frequency varies up and down no more than about 20 Hz as the heater cycles on and off."

The output of the VFO is 3.5 to 4.0 MHz. The transmitter will double the output for use on 40 meters. The Collins PTO may not be easy to find. Fair Radio Sales listed suitable replacement in their catalog, the T195 PTO. Wayne tells me that the new PTO works very well. He uses the same circuit that works with the Collins unit. The Cs and Ls in the Pi tanks were doubled. This new VFO has an output from 1.75 to 2.0 MHz. Now here is your gateway to 160 meters. The 6L6 Special will not have enough drive to quadruple the output for 40 meters without the use of a outboard doubler circuit when using the PTO from Fair Radio Sales.

Inside the Circuit

Let's look a bit closer at the VFO circuit, starting with the PTO (fig. 1). One MPF-102 comprises the oscillator. The Collins PTO contains all the frequency-dependent components. A 1N3018 zener diode holds the voltage steady at 8.2 volts. A second MPF-102 transistor amplifies the output for the next stage, the buffer amplifier.

As the name implies, the buffer amplifier (fig. 2) isolates the 6L6 from the PTO, and at the same times provides a signal increase. The 2N2222 transistor amplifies the PTO signal while the Pi output tunes the circuit for maximum signal at 4 MHz. A second transistor, a 2N3553 or 2N3866, again amplifies the signal to a level needed for the 6L6. The output of this amplifier is again tuned to 4 MHz using a second Pi section. The PTO operates all the time, the buffer-amplifier is keyed on and off. To keep the receiver from hearing the PTO, some method of shifting the PTO's frequency will be needed. While Wayne did in fact mention this, I did not include the schematic.

Wayne uses differential keying. The oscillator always comes on first and goes off last, and all keying filters are in the final-stage cathode. The oscillator (PTO) is always on. When the key is up, the frequency is shifted lower by about 25 kHz, so you never hear it. Since Wayne added more stages in his version of the 6L6 Special, his keying scheme may not work with the original. If you're interested, drop Wayne a letter. I'm sure he would be glad to share his offset circuit with the readers of the QRP column.

Lest we forget, the power supply. Very simple. A five-volt regulator is used as the heart of the supply. By varying the ground connection via a pot, we can make the LM309 adjustable. The stand-by switch removes power from the buffer-amplifier, and PTO. Even with the stand-by switch turning off the main VFO circuits, the power to the heater is still allowed to flow. This will keep the VFO stable even though the unit is in stand-by. The required voltage for the heater is generated by a voltage doubler. If you use the unit from Fair Radio, the PTO requires only 14 volts rather than the 24 volts for the Collins unit.

Remember, this is not a step-by-step construction project. If you use the PTO from Fair Radio, the frequency-determining components in the buffer amp will have to be changed. Also, without the offset circuit, you'll hear the VFO on your receiver. Since it is not possible to design a universal keying circuit for all those different versions of the 6L6 Special, keying the VFO will be up to the individual user.

Since I have not had time to give Wayne's circuit a workout on my test bench, I can't answer questions about it. Write to Wayne Sandford, Jr., P.O. Box 395, Warrington PA 18976 and include a SASE and if asking for copies of circuits (add a few bucks to cover copying costs.)

Odds n' Ends

For those of you who put off buying a HW-8 Handbook, you're out of luck. All 500 copies have been sold. I might do a reprint somewhere down the line, and I am looking for more mods for this little critter. Anyone for 18 MHz on the HW-8?

Just when you thought it was safe to stop reading about QRP, Jerry NR5A compiled an intensive list of QRP projects and mods. Write to Jerry for your own copy,

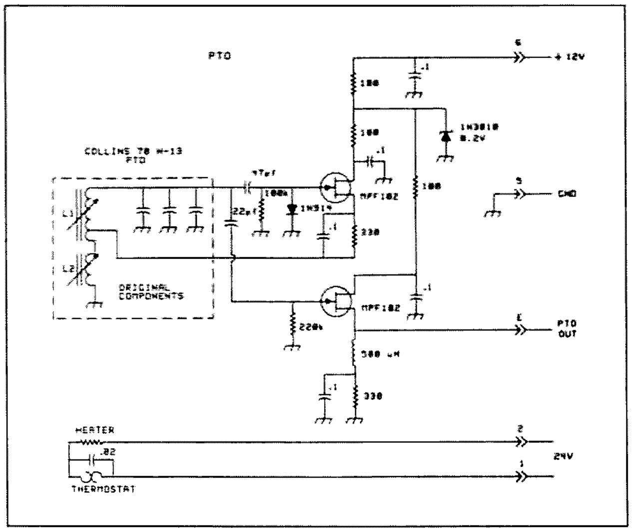


Fig. 1. The Collins 70 H-13 PTO, the heart of the VFO for the one-tuber.

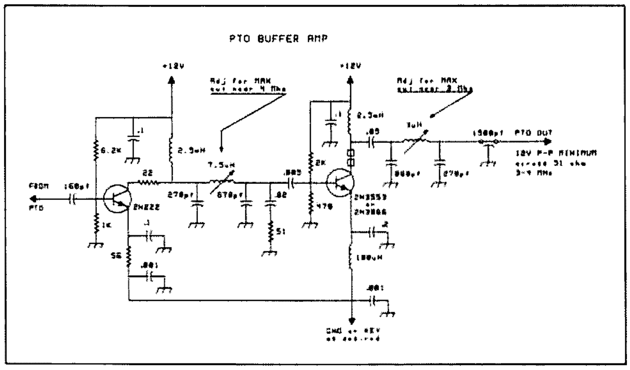


Fig. 2. PTO Buffer Amp, the second stage of the VFO.

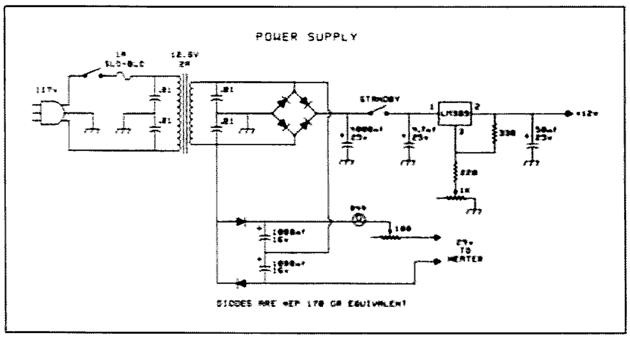


Fig. 3. Power supply circuit for the Collins PTO.

or contact him via Compuserve ID 73230,626. As well, Michael Hopkins WD5GMP has been busy putting together a collections of modifications for the Heath HW-16. While not exactly a QRP radio, the HW-16 can easily be turned down to QRP levels. A no-part QRP conversion for the HW-16 was described by Ade Weiss, WØRSP, in his book, The Joy of QRP, Strategy for Success. At today's hamfest prices, an HW-16 can be had for 10–30 dollars. The matching HG-10B VFO will cost more than the main rig! If you have done some QRP work with this radio, let us know.

I have been starting to collect information on a second book—solar power for the ham operator. I have mentioned before that I operate my complete station—several computers, Packet digi, and yes, even a 200-watt HF transceiver—from the sun's energy. If you are running your shack from the sun's energy, how about helping out in this effort?

Do you own or operate a NCG-15? Have you made any modifications to it? If so, drop a line to me about it. I've had some requests on the subject. Since I have never operated one, I was unable to help.

Looks like there is considerable interest in the Two-Fer. I was able to get some more boards made up. If you have not sent for the info kit by now, it may be too late. Again, if I can get the minimum number of interested people, I'll reorder the boards.

That's a very handsome-looking plaque that Fred Trupin had made for the Two-Fer contest. I would like to see a major QRP award given away—something akin to Ade's Milliwatt DXCC trophy. I'm talking about a trophy from me for the best QRPer in the land. I want to see someone whom has been a dedicated QRPer win a nice-sized trophy—it could be for Field Day, Sweep Stakes, 6L6 Special contacts, or what have you.

Coming up next month will be the 6L6 Special update with a lot of photographs and circuits. My QRP 5er will be showcased soon, as will other projects. If you build, or modify your commercial equipment, share your work with others here in the QRP column.

The Christmas season is upon us. . . everyone have a safe and happy holiday season!

HAMSATS

Number 24 on your Feedback card

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
2310 Romayor Court
Pearland TX 77581

PHASE 3

The AMSAT Phase 3C Launch Campaign officially began September 16, 1987, with the successful resumption of Ariane missions by the European Space Agency (ESA). Their launch program has been on hold since the disastrous Ariane flight V18 in late May of last year. The third stage failed to ignite, and the range safety officer was forced to transmit the destruct command to the vehicle.

The September V19 launch of an Australian communications satellite, AUSSAT 3, and the EUTELSAT (European Telecommuni-cations Satellite Organization) ECS 4, brings the European consortium Arianespace back on a launch schedule that hopes for 44 more satellites in orbit via Ariane rockets over the next three to four years.

Phase 3C waits among those future satellites for the chance to become an OSCAR. Only when it achieves orbit does the title "Orbiting Satellite Carrying Amateur Radio" apply. Gordon Hardman KE3D in Colorado installed the new radiation-hardened memory chips, donated by the Harris Corporation, in the Integrated Housekeeping Unit (IHU). The finished unit was then sent to West Germany for integration into the satellite by AMSAT DL. Phase 3C is ready for launch, and mission V22 may come as early as January 1988.

Ariane's 8th Anniversary

The Ariane program celebrates the eighth anniversary of the first Ariane 1 test flight this month. After a flawless launch in December 1979, Mission LO-1 concluded without a hitch. For the ESA, which was barely four and a half years old, this was quite an achievement.

Mission LO-2, the first launch to carry satellites in lieu of ballast, didn't go as well. On May 23, 1980, known as Black Friday to amateur satellite enthusiasts, an experiment called Firewheel, and a hamsat, Phase 3A, became casualties of ESA and Arianespace's first launch failure.

Three years later on June 16, 1983, Ariane statistics rose from three successes for five attempts to four for six. A new European satellite, ECS-1, and OSCAR 10 were safely in orbit.

Although OSCAR 10 is the most powerful and highest hamsat, it didn't achieve the desired orbit, nor did it escape unscathed from the upper stage of the launch vehicle. After being bumped or incorrectly released from the SYLDA (dual satellite deployment canister), the satellite was left in the wrong orientation with respect to the sun and spinning in the opposite direction the onboard computer expected. Due to the poor sun angle, some parts of the satellite were dangerously cold and there was little available power.

The spin direction was not corrected, since it was easier to adjust the software.

When it was time to fire the motors to correct perigee and inclination, all of the fuel escaped in one long burst during th perigee burn. The problem was later traced to a drawing error in the AMSAT-built liquid ignition unit. The end result was an orbit with a low inclination and a very high perigee. This meant users in the northern hemisphere received 60% less operating time than originally planned. The spacecraft also spends more time in the hostile Van Allen radiation belt.

When Phase 3C is launched, we hope for a smoother ride. Mission V22 will be the first to use an Ariane 4 vehicle. This test or qualification flight will also carry ESA's Meteosat P2 weather satellite and the U.S. PANAMSAT communications satellite.

There are six possible variations on the Ariane 4 design to allow each launcher to be tailored to the payload requirements. The simplest configuration can lift 4200 pounds to geostationary transfer orbit, while the most complex version, with four external liquid-fueled, strap-on boosters, can lift nearly 9300 pounds to the same orbit. By comparison, Ariane 1, which took OSCAR 10 into space, was rated for 3750 pounds. Ariane 4 carries fifty percent more liquid propellant in the first stage than Ariane 3 and sports a new multiple satellite fairing (container) for heavy geostationary payloads. The second and third-stage engines are unchanged from the Ariane 2 and 3 launchers.

Insurance

AMSAT NA (North America) and AMSAT DL (West Germany) are working together to purchase launch insurance for Phase 3C. The goal for AMSAT NA is $10,000. As part of the launch campaign, the insurance would cover the loss of the spacecraft if the worst should occur.

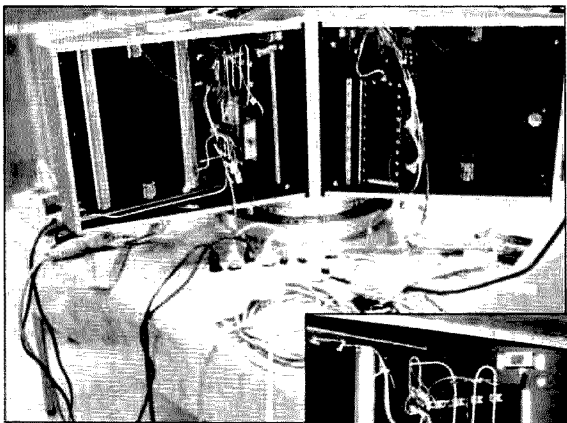
Donations of $10.00 or more to the insurance fund will be acknowledged with a special Phase 3C QSL card and recognition in ASR, the Amateur Satellite Report. Donations of $30.00 or more will bring an AMSAT certificate showing the donor's name and callsign over an image of a Phase 3 spacecraft. Further perks are offered for amounts of $100 and $1,000. AMSAT is a non-profit, scientific, educational corporation and is treated as a charitable organization for tax purposes. Inquiries or donations should be sent to Phase 3C Insurance Fund, AMSAT, PO Box 27, Washington, DC 20044.

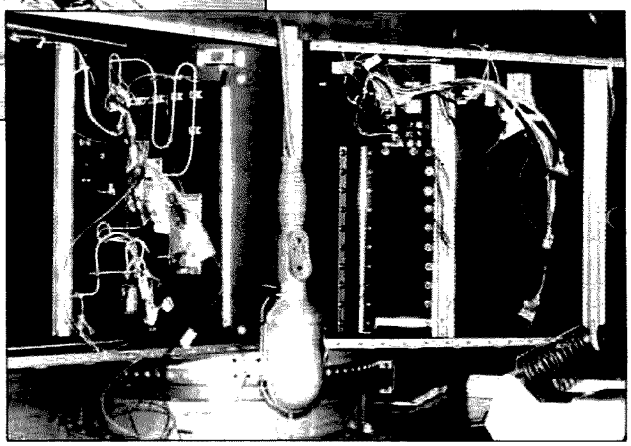
European Rockets

With so much attention on the Soviet space station, Mir, or studying shuttle recovery efforts and our own plans for the 1990s, we discount or ignore the efforts of others dealing in the business of space. Among the newer contenders, Europe leads the way with a serious cost-effective program.

The European Space Agency was created in 1975 to consolidate the resources and activities of the European Launcher Development Organization and the European Space Research Organization. Member countries are: Belgium, Denmark, France, Ireland, Italy, Netherlands, Spain, Sweden, Switzerland, the United Kingdom, and West Germany.

The purpose of the ESA, as stated in its Convention, is to "provide and promote, for exclusively peaceful purposes, cooperation among European states in the fields of space research and technology, with a view to their scientific purposes and for operational space application systems." Financial backing is largely French (60 percent) followed by West Germany (20 percent).





Photos A and B. The Phase 3C spacecraft under construction at the AMSAT lab in Boulder, Colorado.

Ariane rockets are launched from the Guiana Space Center near Kourou, French Guiana, just north of Brazil. The center is on nearly 400 square miles along 37 miles of Atlantic coast at the equator. This location uses the earth's spin to give Ariane launchers a 17 percent payload advantage over operations from the Kennedy Space Center. Also, it's easier to achieve a geostationary transfer orbit when a rocket is launched from the equator. Launches from the Kennedy Space Center must go through complicated maneuvers to achieve the correct trajectory. With two pads in operation, the Guiana Space Center can launch up to 11 missions per year. The tentative schedule calls for ten for 1988.

The ESA and its commercial launch service operations company, Arianespace, appear to be only in the satellite launching business.

The ESA Ministerial Council was due to have a summit meeting in November. Depending on the results of this conference, the future funding and ambitions of Europe's space program may be expanded. Projects waiting for the green light are: the Ariane 5 launch vehicle; the Hermes manned mini shuttle; and the Columbus orbiting lab, designed to interface with the U. S. shuttle program. These endeavors are not cheap. The estimate of more than 12 billion U.S. dollars over the next ten years is likely to be low. Cooperation between the member countries is essential, or the 13-member consortium may end up as a French-German operation.

"Phase 3C waits among those future satellites for the chance to become an OSCAR."

The Ariane system is a three-stage vehicle based on known and proven technology. The Ariane 1 was designed in six years at a cost of 1.2 billion dollars. It stands 154 feet tall, is 12.5 feet in diameter, and weighs nearly 230 tons on the launch pad. All three stages use liquid propellant. The first two have a mixture of UDMH (Unsymmetrical DiMethyl Hydrazine) for fuel and nitrogen tetroxide as the oxidizer. The third stage uses liquid hydrogen and oxygen. This was the first cryogenic engine designed in Europe, but is was based on existing expertise from Germany and France.

Where does the amateur radio satellite program fit into this picture? In addition to Phase 3C, already scheduled and waiting for launch, the German Phase 3D project and AMSAT NA's Phase 4 geostationary satellite program both depend on the Ariane vehicle. These projects are currently proposing to modify the adapter ring between the launch vehicle and one of the main satellite payloads to accommodate a hamsat. If this is acceptable, the active amateur satellite would be about three feet high, ten feet in diameter, and weigh nearly 900 pounds. Studies and designs have already begun on both projects. The future has incredible possibilities.

Ariane Launcher

Type	Length (feet)	Payload to GTO (pounds)
Ariane 1	154	3750
Ariane 2	161	4300
Ariane 3	161	5700
Ariane 4	192	4200–9300(*)

Table 1. Overall launcher length and vehicle lifting capabilities to GTO (Geostationary Transfer Orbit).
** Depends on strap-on booster configuration.*

Satellite Updates

AMSAT-OSCAR-10 may not be back in operation until the first of December, but as of this writing, we still hope for activity in November. The ground-control stations around the world will assess the situation carefully before allowing even guarded transponder operation.

Fuji-OSCAR-12 enthusiasts were surprised in mid-September when the satellite did not show up in the correct mode. In fact it was off! The previous operating schedule was just too ambitious and overloaded the battery. Later in the month, all was back to normal. The new schedule includes plenty of mode JA and JD activity. While the analog transponder mode is usually on for two continuous days when it is activated, the rules for the digital system continue with a two-hour on/off cycle during a single day of activity. Sufficient recharge time has been allowed to avoid the problems of September. Check the AMSAT nets and publications for updates.

RS-10/11 continues to do well, but an operating schedule is still not known. After two months of continuous KA mode on RS-10, from August through early October, many would like to try more T- mode activity on RS-11.

I have received several calls and letters from you with questions about small antennas for RS chasing. The October Hamsats column gave several potential operators the needed push to try out mobile satellite activity, or to listen for the new satellite pair on simple antennas. Apartment dwellers and others with stringent deed restrictions have found that with reasonable receiver gain, indoor or attic-mounted antennas can work very well. Bob WA5PCD has made ROBOT contacts with RS-10 using a dipole for ten meters and a Ringo (no Ranger) on two meters. The uplink power was 12 watts, the antennas were in the attic, and the receiver was a Drake 2B with no preamp. Bob admits that a preamp would help, but for now he is at least on the air. Come on up and check the activity on these hamsats. New countries and new operators seem to show up every day.

Number 32 on your Feedback card

PROPAGATION

Jim Gray W1XU

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U.S.S.R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U.S.S.R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.
NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

HF conditions for DX are a mixed bag this month. In general, HF DX always suffers at the solstices, especially in the winter when days are short and nights are long in the northern hemisphere.

Look for an active-to-disturbed geomagnetic field around the first of the month, and again about the 10th, the 20th and 30th. Be aware of some possibilities of much larger disturbances between the 19th and 23rd, when geologic disturbances may be expected as well as geomagnetic ones. When the earth's magnetic field is active, HF paths near the poles are very uncertain, and often impossible. However, trans-equatorial paths can be quite useful. These disturbances can take place within a few days before or after the predicted days. The chart will assist you in picking the days which ought to be Good (G), Fair (F), or (P) Poor. A January preview: look for very disturbed conditions between the 6th and 9th.

DECEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
		1 P	2 F	3 G	4 G	5 G
6 G	7 F-G	8 G-F	9 F-G	10 G	11 G	12 G
13 G	14 G	15 G-F	16 F-P	17 P	18 P	19 P
20 P	21 P	22 P	23 P	24 P-F	25 F-P	26 F-G
27 F	28 F-P	29 P	30 P	31 P-F		

HAM PROFILES

Number 31 on your Feedback card

Janette LeBlanc

Tom LeBlanc NX7P
979 Young Street Suite E
Woodburn OR 97071

SHE DID IT

Janette was born on June 15, 1976, in Bakersfield, California, with the umbilical cord wrapped tightly around her neck. We got to see her about two hours later. A specialist was called to observe her. Later, doctors instructed us to do a special range of motion exercises with her and we did these for years. We were very thankful to see Janette grow up to be a normal, healthy girl who can enjoy life and meet interesting challenges.

One of Janette's first challenges was amateur radio. She expressed an interest in the hobby in the third grade. In a special assignment, her teacher instructed the students to do a project with dad. Any project would be fine, as long as it was with their dad. After kicking around some possibilities, Janette decided she wanted to learn the Morse code. When the project was due, she demonstrated to her class how messages can be sent and received through Morse code. Her classmates wrote words on a board hidden from Janette's view. I sent the code, and Janette decoded and told the class what words they had written on the hidden board. She also read a report she had prepared on the history of Morse code. The teacher encouraged her to continue on to get her ham license someday.

Becoming a Novice

About two years later, at age 10, she decided to get her Novice license. She attended a Novice preparation class offered by Clackamas Amateur Radio Club, in Oregon City. She took her test in November of 1986, shortly before the Novice enhancement came.

Janette became KB7AEZ and worked several states on 40 meters. When Novice enhancement came, she made some contacts on 10 meters, but did not work the 220 MHz band. She liked the idea of getting on two meters where more repeaters and autopatch equipment are available. She decided in late June to go for an upgrade. She wondered, "Do you think I can do it?" We worked together off and on from that point. During the last two weeks of July, we picked up the pace. Studying just before bed proved profitable. She read my study sheets during the day and answered questions that I prepared. It was almost like learning a new language.

> *"Success and accomplishment are good for us all."*

So many things were totally foreign to Janette. At times we felt like giving up. The challenge of this project required hard work from both of us. During the last week before the exam, I took two afternoons off work and we studied together at the library. Breaks were fun, as was dinner out together those two nights. Those were fun times for both of us, since we spent time together and got to know each other a little better.

The first of August came, and she was ready but very nervous. We went to Portland Community College for the test. On the way to the test, I told her several times that the volunteer examiners are her friends. I encouraged her to ask questions if she did not understand any instructions. I tried to help her to understand that the VEs are on her side, because they want to see more young hams. After the test, we sat in tense anticipation as the examiners graded it. A VE looked up at me and held up one finger. I wondered if he meant that she missed it by one point. He said, "No, she only missed one question!" She passed with a 96% score. While she waited for her temporary papers, I presented her with a micro handheld, carefully fitted with a bow on its battery pack. She was embarrassed, proud and relieved, all at the same time.

She did it! Success and accomplishment are good for us all. When we succeed in one thing, it transfers to other areas of our lives, making it easier to succeed. Our Incentive Licensing Program offers several levels of challenges and opportunities for success.

Janette monitors the Mt. Hood repeater, and we often talk on simplex to sharpen up her operating skills. We use our handhelds to keep in touch when my XYL Karen and I are away from home. On one occasion, I went deep sea fishing with my dad. Janette maintained contact with us through the coastal repeaters, while she and the rest of the family went shopping. Ham radio was especially helpful that day because the fishing boat was unexpectedly delayed (three hours) coming back to port. This information gave the family more flexibility in shopping and sight-seeing. They knew exactly when to pick us up at the dock.

A Special Accomplishment

A couple of humorous things came up in the early stages of Janette's technician preparation. When I explained about simplex operation, she seemed satisfied that that was pretty simple to understand. After I explained the use of split input-output frequency separation in repeater operation, she guessed, "That's called complex right?" I said, "No, duplex." When we first discussed the ionosphere, I told her that is where there are a lot of free ions and electrons. Janette responded, "You mean Free-ons?". Helping my daughter into ham radio has been a very enjoyable and memorable experience. Neither of us will ever forget the hard work, the feeling of accomplishment or the joy of doing something special together.

I have heard several people say that we need younger hams. Well, the Novice Enhancement will certainly help to make this possible. The new Technician-General split test makes the Technician test a lot easier than it used to be. This will encourage more people to upgrade. Even young people with no background in electronics can grasp the concepts with some help. Concepts can be rephrased into more understandable vocabulary. Various quick-learning tricks can be used in other places. Young people are smart. If we encourage them and help them, perhaps we will realize our goal of adding more young hams to our ranks.

Tom LeBlanc NX7P lives in Oregon with his XYL and three children. He has just completed a licensing study guide for radiotelephone operators.

RTTY LOOP

Amateur Radio Teletype

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

RTTY CHEER

The end of the year is a funny time. With various giftgiving opportunities, the urge to shop is upon us. With the end of the calendar year, the urge to clean up loose ends is here. And with a new year about to dawn, one always hopes to get a glimpse of something new. This month, I think RTTY Loop will satisfy all!

Queries

Dennis Roy, of Detroit, Michigan, writes that he has been a longtime short wave listener, who does not own "any fancy equipment, just an old Hallicrafters S-38C." He is curious about monitoring press and other commercial RTTY signals, and asks the universal questions:

(1) What is the cheapest equipment available to monitor commercial RTTY, including the cheapest receiver, terminal unit, and computer?

(2) What is the best equipment available?

(3) Are there any decent world news services to monitor? Are some of them scrambled and, if so, should I just give up on the idea?

(4) What is a good reference manual for frequencies to monitor?

First off, any receiver stable enough to receive single sideband is, in general, stable enough for RTTY. Extra money does buy some nice features, such as filters that can strip off an offending CW signal or digital readout. These, however, aren't really necessary.

What kind of money are we talking about? You can buy a new serviceable receiver for a couple of hundred dollars or spend some time at a local hamfest and spend a whole lot less. Go with a knowledgeable amateur. There are gems among the rubble at hamfests. What you will be looking for is a stable, general-coverage receiver with easy frequency readout and adjustable BFO. I can't think of a hamfest I've ever been at where there haven't been a few receivers that would fill the bill. Lacking a 'fest, you might check the used equipment shelves at a local ham store. The price might be a tad higher, but you won't feel as rushed to buy as at a flea market. Still no? Find a local ham, through him or her a local club, and make your needs known. You never know who has a boat anchor lying in the basement.

The cheapest terminal unit? There are none! You mentioned computers—there are programs for several of them which decode RTTY audio directly. They're not as facile as a dedicated piece of hardware, but they're cheaper.

If you insist on hardware use simple little one-chip demodulators. This is just another name for terminal units, which can be built for a few dollars. See back issues of RTTY Loop for details.

The best? If I have to blue-sky it, I have a spec sheet on a RTTY demodulator here that would knock your socks off, and there is this receiver that will drag signals up out of the mud like a new detergent. The important thing to remember, however, is this: If you can hear them, you can copy them with most any RTTY setup. If used as a terminal, the computer type is irrelevant, anyway, save for the communications program that runs on it. The software features is the salient point here.

I've seen lots of books on press frequencies, and reviewed or commented on them in the column. My main approach, however, is to scan the 8 MHz to 15 MHz frequencies slowly, and look for copiable signals. Sometimes it's English, sometimes Spanish or Italian, and occasionally a language I can't directly identify. But that's the best way to know what you can hear, from where you are, with what you're listening on.

What's New in RTTY Gear

One tradition of RTTY Loop's December edition has been a look at current items of interest to RTTYers. I want to stress that I derive the information presented in this segment of the column, unlike my usual material, from ads, not equipment. You are on your own—let me know what happens!

Kenwood features the TS-440S HF transceiver, complete with a FSK mode, although it is called "AFSK" in the ad. Even with the statement "AMTOR compatible", it sounds like they're talking to us.

There are various interfaces in the Barry Electronics Corporation's ad. It looks like they have a selection of Kantronics, Microlog, MFJ, and AEA equipment on hand. Nothing much detailed, just all kinds of alphabet soup. QSL?

Another ham dealer featuring AEA, MFJ, and Kantronics is Northeast Electronics Supply Company, Inc. There is again only sparse details, but worth a shot.

AEA's PK-232, an item which has had more than a passing notice in this column, is prominent in our tour. With new programs said to display FAX on Commodore and IBM-compatible screens directly, this bears another look.

More complete lines, including some HAL equipment, is featured in the EGE, Inc. ad. They seem to have nearly everything.

Hamtronics has an interesting little board in its ad for an FSK data modulator and demodulator board. They sell for under forty bucks a piece, for up to 1200 bauds. With "202" in the model number, I wonder what standard they follow?

Michigan Radio is another purveyor of fine goods, including AEA, Kantronics, and MFJ. Maybe you should use carbon paper for the postcards?

GLB Electronics features a portable packet controller. Sitting next to a nine-volt battery, the battery looks big! Low-current drain and standard features make this package look very attractive.

A communications program for IBM PC compatibles is described by ExpertQ. Supporting many Kenwood transceivers, most multi-mode terminal units, and PC-type computers.

FAXers please note the ad placed by Elmer Schwittek K2LAF for an updated FAX receive program for IBM PC compatibles. Dan Diehlman AE6G offers yet another full-featured IBM PC type communications program.

RTTYers, be sure to check out Austin Amateur Radio Supply. They carry what by now is a familiar assortment of RTTY items. Another Texas dealer to investigate is Madison Electronics Supply. They have a RTTY line that is becoming a "standard" today.

Finally, there is the Brapper Box. Here is a device to couple atransceiver to a TNC. Why? Because some modern transceivers have more than mike and PTT on their mike connectors, and interfacing them can be a nightmare. I've yet to do it myself! Drop Electron Processing, Inc., a note about this unit.

I encourage you to look for the ads in the October, 1987, issue of *73 Magazine* for pictures and additional information. When writing to any of these folks for information (or even to order!), be sure to tell them you saw them mentioned here, in *73*'s RTTY Loop.

Teletype Supplies

Kenwood USA Corporation
2201 E. Dominguez Street
Long Beach CA 90810

Barry Electronics Corporation
512 Broadway
New York NY 10012

Northeast Electronics Supply Company, Inc.
PO Box R-G
Whitehall PA 18052

AEA
2006 196th Street SW
Lynnwood WA 98036

EGE, Inc.
14803 Build America Drive
Building B
Woodbridge VA 22191

Hamtronics, Inc.
65-D Moul Road
Hilton NY 14468-9535

Michigan Radio
28360 South River Road
Mt. Clemens MI 48405

GLB Electronics, Inc.
151 Commerce Parkway
Buffalo NY 14224

ExpertQ
10245 Leatherwood
Fort Worth TX 76108

Elmer W. Schwittek K2LAF
429 N. Country Club Drive
Atlantis FL 33462

Dan Diehlman AE6G
5748 N. Bond
Dept. 73 (RL)
Fresno CA 93710

Austin Amateur Radio Supply
5325 N. IH 35
Austin TX 78723

Madison Electronics Supply
3621 Fannin
Houston TX 77004

Electron Processing Incorporated
P.O. Box 708
Medford NY 11763

Loose Bits

In the loose ends department, a few notes. In the October '87 edition of RTTY Loop, I relayed a large list of FAX stations for those interested. The call sign of the seventh station, however, is not printed. I assume a glitch in data transmission between here and *73* HQ is responsible. We transfer this column electronically! The line should read:

KVM70 HONOLULU, HI, USA
9982.5, 11090, 16135, 23331.5

Also missing is proper credit for the source of this list. My flying fingers forgot to type the name of Wally Vance, KW5N, of Meridian, Mississippi, as the originator of this massive work. Thanks, Wally, for passing it along.

Here's my promised peek at next month. One of the all time most popular columns was the RTTY program for the TRS-80® Color Computer presented in the July 1987 column. January's column should go one better with another program for the CoCo that includes many, if not all, of the features you have been asking for.

In the meantime, I remain as accessible as ever, via mail, at the above address, CompuServe (ppn 75036,2501), or Delphi (username: MARCWA3AJR). Remember to enclose a stamped, self addressed envelope if you wish a return response by mail. The complete index to RTTY Loop is still available, detailing over ten years of this column. Just send a SASE with postage for two ounces to the above address, and I'll be happy to send one to you. In the meantime, all the best for a wonderful holiday season to each and every reader of RTTY Loop!

Number 29 on your Feedback card

OP-ED

by Larry Ledlow, Editor-in-Chief

Small is Beautiful

I know the story all too well. I've been there. You've come back from the East-West FM ATV DX Society Region 4 Hamvention about $1500 lighter than when you left. You've just bought the latest Q-Radio Model BFD-4000XS pico-sized, 10-band handie. In your hurry to get home and charge the selenium-thorium battery pack—you *knew* you should have bought the car roof solar power unit—you got two speed warnings and a ticket for going through a red light. And by the way, you forgot to close the car door and turn out the headlights when you ran into the house. Boy, oh, boy, you just can't wait to fire that little beast up and rap with the guys on the local repeater. Well, at least you *think* there's a local repeater on 10 GHz.

You scatter the box, wrappings, and radio instruction manual in the wind. You don't notice the cat bat the crumpled sales receipt under the refrigerator. You absolutely *must* show this new rig to your better (and perhaps more rational) half. This is called the retail sales chain game. The salesman sold it to you (or did you sell it to yourself?), and now you have to sell it to someone else. After all, this little radio has come to share your household. It will add enormous dimension to your hamming lifestyle, and it's only right to properly introduce it to your other loved ones: the HF rig, the computer, and your XYL. But where is she? Ah, that's right. She said she'd be home late from closing a multi-national merger deal. Then you'll *both* have something to celebrate.

Alone in the Dark

Make sure you don't lose track of the real priorities, though. The first order of business is to charge the batteries. Now, where did that manual go? Oh, never mind. You'll just use the optional, drop-in quick charger. That should only take about a minute. Who needs the manual for charging, anyway? You drop the rig in, turn the charge rate knob to the MAX position, and flip the switch. ZAP! Your house lights go out. So you fumble around groping for that flashlight you bought a couple of years ago. Ouch! Wrong drawer. You wonder if you're bleeding much. Ah hah! Got it! You fill with disappointment at the flip of the flashlight switch. Dead D-cells. Nothing worse than dead D-cells. Blasted ancient technology! Suddenly, you blind yourself with a flash of brilliance. You can use the car headlights to illuminate the garage and find the circuit breaker box. Then you sigh when you see the headlights and dome lamp glowing in death like embers in the moonless night. Borrow a flashlight from the neighbors? Nah, it's a half-mile walk. After all, you bought this hilltop house in the country to get away from neighbors. You have to be self-reliant in the country. No, the rain isn't a problem. You could walk a mile in the rain if you wanted.

You really only take half an hour to restore power. All those antennas in the garage make the breaker box pretty hard to find in the dark. Look in the mirror. All those scratches on your face from extruded aluminum make you look like you cut yourself shaving. That's what you can tell everyone at work tomorrow. Except you don't shave your forehead. Ah, well, never mind. The Model BFD-4000XS beckons your attention.

You inspect the drop-in charger, and it looks unscathed. Take a real close look at the battery pack. Funny how the rig looks two-toned now with a dark brown battery pack. You don't *think* it was that way when you bought it. Oh, well, it's probably covered by the warranty, right? Just slip those batteries off and replace it with the extra heavy duty power pack. Heat sink? Nah, no need to screw that on. You just want to try the radio out for a few minutes. There you go. No muss, no fuss. The full-charge ready light comes on in 48.273 seconds, according to the nifty, multifunction, LCD VOM-timer on the charger.

Now You're Cookin'

Great! You're in business now. Get out the repeater directory and start loading up some of the 4096 memories. Isn't that pico-sized HT just amazing. It's got more memory cells than the average domesticated goldfish. At least that's what the ad said. OK, OK. So the League doesn't list a 10 GHz repeater in your state. That's probably because most repeaters in that band are "uncoordinated." No problem. Just put the handie in scan, and go make yourself a cup of coffee. After five minutes of scanning you still haven't heard any signals. No problem. Just pop down to 2300 MHz and listen. In a few seconds the rig's voice synthesizer announces, "Signal detected! Awaiting command!" "Receive," you order. Hey! This could be fun! The squelch breaks open, and you hear a funny tone. Hmmmm. All these years of synthesized rigs, and they still haven't fixed all the intermodulation problems. Forget 2300 MHz. You head for two meters instead.

The rig scans, and the squelch opens again on what must be a local repeater. You request a signal report. A voice comes back in a funny language. Probably a little tropospheric ducting. Check that frequency again. Hey, wait a minute! You've just transmitted out of band. You still don't know you just had a brief chat with a Soviet cosmonaut. And you gave your callsign, too! Maybe you won't get a pink slip.

You hear a car in the driveway. Now's your chance to justify the little radio's existence in your household. Quick! Tune to a repeater you *know* is active. You key the mike at the moment your wife steps inside. You *must* show her how happy this little radio makes you. And then you notice a small puff of smoke from the back of the rig. The display winks twice and disappears. Keep smiling! "Hi, honey," she says with open arms. "Did I have a rough day closing that deal." Keep smiling! That smell? Oh, nothing. You just burned some coffee on the stove, right? Keep smiling! Then show her the rig. Ta dah! Doesn't she think it's beautiful? "I think it's cute," she says, and you flinch. Cute? It's a *beautiful* piece of engineering. "Whatever you say, dear. As long as you're happy with it." Mission accomplished! She's accepted it, and you breathe a sigh of relief. Now what happened to that sales receipt? 73

ENDS AND ODDS

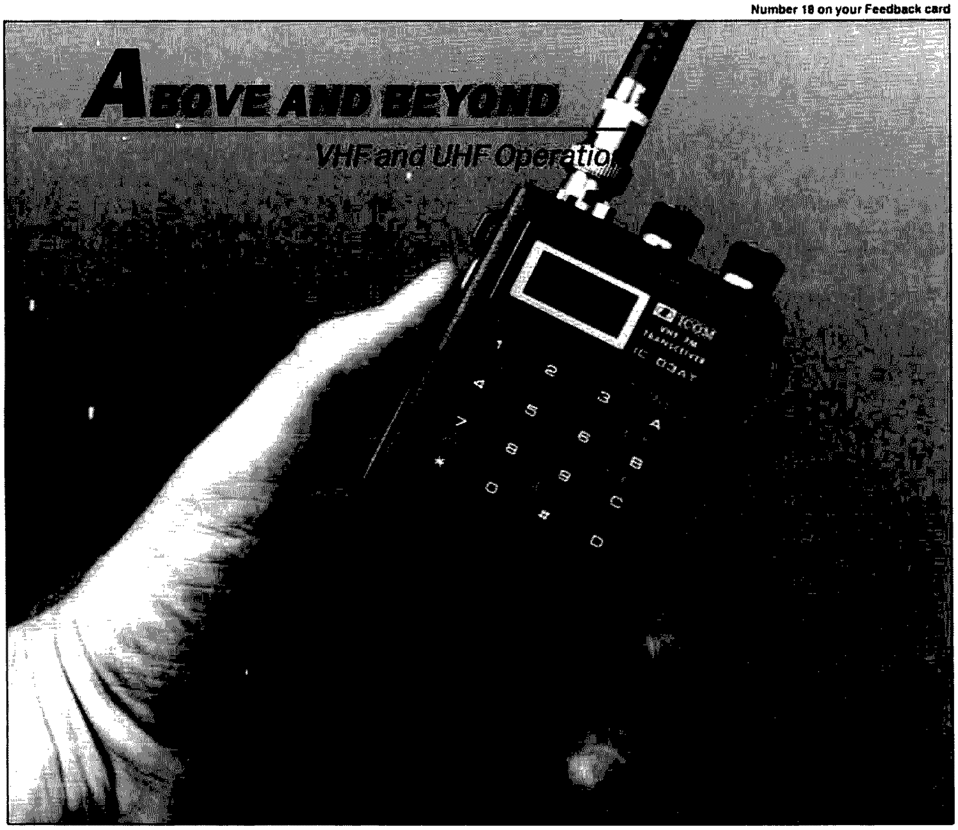
Special Thanks:

KT2B deserves a big hand for his contributions to this issue. Keep up the good work.

Correction:

Everyman's Microwave Amp (KT2B), *73* October: Figure 1—For power supply, use 3-wire AC connection instead of 2, and ground the chassis for safety. Fuse and AC power switch should be in the same leg (not in opposite legs) and should switch the hot side of the AC line. Also, in the schematic of the 23cm cavity amp plate current will be easier to read if the milliammeter is inserted in series with the HV line.

Number 18 on your Feedback card



The ICOM 03AT handheld.

Pete Putman KT2B
3335 Fieldstone Dr.
Doylestown PA 18901

A LITTLE HT HISTORY

This month's column deals with the world of hand-held radios. I've chosen the IC-03AT as a typical example for two reasons: It covers 220 MHz, a band very much in the news recently, and it's made by a company that produces more models of handhelds than anyone else in the world.

Let's look back 10 years at the state of hand-held radios. You could choose from three or four cumbersome, crystal-controlled, battery-hungry models. There were also some hybrid portables, such as the Drake TR-22 and TR-33. A combination base/mobile from Wilson Electronics with a 10- or 3-watt power option was also popular. All of these units operated FM in the 144–148 MHz range.

The majority of 2m FM users then did not use handhelds. Most preferred base or mobile radios with 20–30 watts output. My first 2m FM transceiver was a Genave GTX-10, running 10 watts output on 10 crystal-controlled channels, which I bought in December, 1975. At the time, Genave also made a cute 3-channel 2- watt handheld intended for the commercial market, but it was adaptable to ham needs.

Several events revolutionized the hand-held market in the late '70s. First, the FCC deregulated repeaters, making them considerably easier and cheaper to install. Then, the FCC designated a second repeater sub-band in the 145.100–145.500 MHz region, further encouraging the repeater explosion. Finally, Wilson Electronics introduced the now-immortal MKII and MKIV handhelds. Although crystal-controlled, they were extremely small and offered quick-change battery cases.

Now we had no excuse to buy a handheld! My bank account was $250 lighter after buying my first MKII in mid-1978, and others followed suit. Around the country thousands of MKII and MKIV (4-watt version) transceivers came on the airwaves. Repeaters abounded! Hams took their handhelds everywhere, operating from skyscrapers, boats, cars, mountaintops, and even commercial airline flights. The latter operation resulted in a flurry of incidents that led to serious restrictions on HT operation aboard airliners.

The next step up was the synthesized HT. Henry Radio dropped the Tempo S-1 synthesized 2-meter handheld on the market, followed closely by the Yaesu FT-207R. Hamdom reacted predictably. The demonstrator FT-207 disappeared from the booth at Dayton (despite being secured with a chain) and all dealer units sold out quickly on Friday morning. Now, you "weren't anybody" unless you had the latest handheld!

"Hams took their handhelds everywhere . . . skyscrapers, boats, cars, and even commercial airline flights."

The next handheld then turned out to be the ICOM IC-2AT, followed closely by the Kenwood TR-2400. "No fair!" cried the hordes. Hundreds of hams rushed out to put the latest synthesized radios in their shack, delegating piles of old Wilsons, Motorolas, Genaves, and newer MKII radios to flea market tables. Others put them up for sale in the Yellow Sheets, and some were donated to clubs and local civil defense organizations.

The Humble HT

The point of all of this? HTs have come a long way in a short time. Virtually unknown 10 years ago, the ubiquitous handheld is taken largely for granted nowadays. You'll find them everywhere—in gloveboxes, atop the fridge, in purses, backpacks, you name it. Handhelds are made for 144, 220, 440, and 1260 MHz—even 10 and 15 meters! Accessories abound with docking boosters, chargers, custom battery packs, external amplifiers, antennas, VOX headsets and speaker/mikes in plentiful supply.

Unlike most equipment, the hand-held transceiver tends to be an impulse purchase. How many amateurs have you known who arrived at the latest hamfest with $300 burning a hole in their pocket, looking to buy a new toy? With FM operation as popular as it is worldwide, look for more significant advances in hand-held technology, such as multi-band radios (already a fact with the FT-727, reviewed in this issue) and perhaps even multi-mode radios. In fact, Santec made an SSB/FM 2-meter portable for a short while but it was pulled from the market.

How about multi-mode handhelds for 6, 220, and 432? With the continuing evolution of the OSCAR, FUJI and RS satellites, a handheld with a simple turnstile antenna might soon be all you need for worldwide communications. Can't wait? Then get one of the remote base station controllers and work everything from your HT. This is a feasible solution for amateurs who live in areas with antenna restrictions and severe TVI problems. Simply locate the station atop a nearby building or mountain and link up on VHF/UHF.

Where would public service be without handhelds? The evolution of portable packet stations has radically changed traffic handling. Many times the only communications available from a remote location have been through a handheld. Think about all of the forest

fires, floods, hurricanes, tornadoes and other natural disasters you've read about... handhelds were surely in use each and every time. On a lighter note, imagine keeping in touch with your buddies at Dayton without a handheld. Unthinkable, right?

Trials and Tribs of HT Use

We've come to depend very heavily on hand-held transceivers... even to the point where they are used in totally inappropriate applications. Consider that same impulse buyer who has just picked up a brand-new FB-HTX1234. After using it around the house and at nearby hamfests for a month or so, he decides to try it from the car. Hmmm, not so good. That little rubber duck antenna doesn't hack it. Better get an external whip, preferably a ⅝ wavelength loaded model for some gain.

Now he hears the repeater much better, but for some strange reason, it can't hear him all that well. "Why is that?" our ham muses: "I've got a gain antenna, and the repeater is full-quieting. Doesn't make sense!". Well, it does make sense if you stop and think about the fact that (1) the repeater is likely running more than 100 watts, (2) using a gain antenna array, and (3) sited in a favorable location. Of course you'll hear the repeater's signal better than it will hear you! So, our HT-mobile fan goes to his nearby dealer to purchase a 25-watt solid-state brick to give his signal that needed boost. A preamp on receive would be handy, too.

Now the repeater hears him fine. He hears it fine, too—as well as all kinds of intermodulation products like paging services, taxi dispatchers, even the local FM radio station! Not only that, it's a real pain having to drive with one hand while holding the HT near his ear to hear above the ambient car noise. The speaker mike he bought doesn't help either, since he must hold that near his ear, also. The HT slides all over the seat, and the coax from the antenna jack to the amplifier keeps coming out of the BNC connector.

Argghhh! After a few near-collisions with another car while wrestling with the whole mess, he gets disgusted and trades everything in for a 25-watt mobile radio... with a helical resonator in the front end, built-in power module, 3-watt audio amplifier, easy-to-read display, large tuning knob, GaAsFET front end, and PTT microphone. Well, this scenario is played out every month all over this country as a continuing wave of first-time hand-held buyers try to get 25 gallons out of a 5-gallon container. It can't be done.

Remember that the front-end design of most handhelds is mediocre at best, and you're making a bad situation worse by putting a gain antenna and preamplifier in front of them.

By worse, I mean in terms of selectivity, not sensitivity. And selectivity is accomplished by means of filtering, which translates into a certain physical size for a given filter—size that just isn't available in the average hand-held transceiver. The well-designed mobile transceiver will typically offer dual-conversion, employing two or more stages of filtering. Such a design might employ four to six poles at the first IF and two to four poles at the second IF. Such a radio will also employ gain stages in a configuration that offers wide dynamic range to avoid spurious and intermodulation products.

This isn't to say that you shouldn't buy a hand-held radio—far from it! You'd look silly with a mobile rig strapped to your belt at a hamfest and it would take a toll on your battery packs! An HT is often a very valuable piece of equipment both in and out of the shack. Just don't expect unreasonable things from your handheld in terms of performance, because it just can't deliver most of the time! (And for gosh sakes, if I see another HT-mobile type careening down the interstate with a VOX headset falling over his face, driving with one hand and trying to retrieve the handheld from under the back seat...well, enough said.)

What's New in HTs

Kenwood finally got their act in gear with a full line of 220-MHz equipment for Novices. ICOM took a bold step by gambling on the outcome of Novice Enhancement with regard to 220-MHz base and mobile operations, and so took first place with a complete line of radios, among them the aforementioned IC-03AT and IC-3AT. Now Kenwood has rushed into the fray with a 220-MHz version of the TH-215 transceiver, adding a compact TM-321A for mobile work, to boot. Think the folks in JA land are excited about enhanced Novice privileges? You bet. How long will it be before we see an American-made 220 MHz handheld? How about it, Ten-Tec?

VARIA

Yaesu has stolen a march on everbody by introducing the FT-736R, upgrading the popular FT-726R with full VHF/UHF coverage from 50 through 1296 MHz. We'll have a review of it in the next few months (in between everything else), preferably after using it during a major contest such as the January VHF Sweepstakes. Couple this with the FT-767 design, and you can see where the future lies: A multi-band, HF/VHF/UHF superstation covering everything from 1.8 MHz to 1296 MHz on transmit, offering general coverage receive within that same range. The price? Probably around $2,000. Might be worth it to have everything in one package, though.

> ***"Virtually unknown 10 years ago, the ubiquitous handheld is taken largely for granted nowadays."***

Hamarama '87

Once again, October has come and gone as you read this, and that means we've had another running of the PackRats Hamarama, organized and supervised by the Mt. Airy VHF Radio Club of Pennsylvania. This year's event spanned two days: There were seminars and presentations on Saturday, October 10, and the famous flea market on Sunday. The Mt. Airy Club has been around for over 30 years, and has sponsored this weekend for quite a while. Some of you readers will recognize the club name from its continued domination of the Unlimited class in the January Sweepstakes. In fact, they have won this category every year for over 25 years! (Kind of like the old New York Yankees... everybody keeps yelling: "break 'em up!")

The dedication of these folks to promote VHF/UHF activity and advance the state of the art is evident not only in their contest scores, but in the series of activity nets they regularly run every Monday evening on 50 through 1296 MHz, featuring check-ins from all over the Atlantic Coast region, inland states, and even Canada. Their newsletter is a first-class effort, mailed monthly to several hundred people. Members reside in all call areas and include some pretty famous names in VHF/UHF operations.

The icing on the cake is, of course, the Hamarama. This year's run featured presentations on portable and mountaintop contesting by John Lindholm W1XX, UHF and SHF preamplifiers by Joe Reisert W1JR, amplifiers for 3.5 and 5.7 GHz by Dave Mascaro WA3JUF and Ron Whitsel, and a panel discussion regarding the adoption of a 50-MHz DX Window. Yours Truly participated in this event, along with three other amateur radio columnists: Joe Reisert, Steve Katz, and Bill Tynan. I'll have a full report on this panel in next month's issue, and all 6-meter enthusiasts should take note! The impetus for this discussion were the chaotic conditions experienced during the intense Es openings of the 1987 June VHF QSO Party, where many stations from England, Portugal and Norway couldn't break through the QRM on 50.110 MHz to make stateside contacts.

The proposal is to set aside the segment from 50.100 to 50.125 as a DX Window during all VHF contests. This would ensure that many of these DX stations (most of whom are limited to 100 watts ERP!) would have a chance to be heard and worked by US and Canadian stations. The problem will only get worse as the next sunspot cycle ascends, which officially began in September of last year. Enhanced propagation via both Es and F2 layers will result in general bedlam on six meters—unless something is done about it now. Keep in mind that whatever action taken, such as forbidding stateside-to-stateside contacts inside the window during the major contests, is likely to be in the form of a gentlemen's agreement.

See you next month with the Best and Worst of 1987! 73

73 INTERNATIONAL

edited by Richard Phenix

NOTES FROM FN42

And so another year is about to bite the dust, and again amateur radio operators have shown the countries of the world how to talk to each other—but nobody else seemed to be listening. As usual. Let's keep on setting an example, however. Sooner or later somebody will notice. And here's a tip for you if you want some tips about international dealings. A free information packet on the subject is available from QCI International. Write for it, or call: Ms. Cynthia Williams, Dept. 5026, International and Domestic Negotiating Institute, PO Box 882, Red Bluff CA 96080; (916) 529-0246, Extension 5026. (QCI also has offices in Helsinki, Lima, Melbourne, Paris, Sidney, and Vancouver, BC.)

To help set that example, here are the December events you can mention during those DX contacts: National Day—Central African Republic, 1st; Thailand, 5th; Bhutan, 17th. National Holiday—United Arab Emirates, 2nd; Laos, 3rd. It is Independence Day on the 6th for Finland, 7—Ivory Coast, 9—Tanzania, 11—Upper Volta, 12—Kenya, and 16—Bahrain.

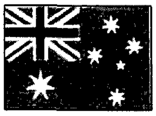
Other events: 1—Anniversary Day, Portugal; 5—Discovery Day, Haiti; 10—Human Rights Day in several countries; 13—Republic Day, Malta (and on the 18th for Niger); 15—Statue Day in the Netherlands and Bill of Rights Day, United States; 16—Victory Day, Bangladesh (and on the 23rd for Egypt). On the 25th it is Christmas, Noel, Weihnachtstag 1, Navidad, クリスマス, and عيد الميلاد.

26—Boxing Day, Canada and Great Britain; 27—Constitution Day, North Korea; 28—King's Birthday, Nepal; and 30—Anniversary Day, Madagascar.

ROUNDUP

***Licensing Information from around the world:** Each month in 1988 you will find right here the latest dope on how to get licensed for operating elsewhere in the world. [Any changes in YOUR country recently? Let me know! —Ed.]*

Here's a timely tip if you're planning a visit to the United Kingdom: A Temporary Operating Permit can be requested by a U.K. licensed operator for a visiting licensed operator to operate under his personal callsign for a period of seven days or less. There is no cost and the permit can be obtained in about a week. The U.K. op should write: The Radio Amateur Licensing Unit, Post Office Headquarters, Chetwynd House, Chesterfield, England S49 1PF.



AUSTRALIA

Jim Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria, Australia

VK0HI

At the time of writing this [September 9, 1987], Dave Shaw VK3DHF (better known to the world DX fraternity as VK0HI) is aboard the Antarctic supply ship, *Nella Dan*, headed for Heard Island. YES! He is going back down to Heard Island for a six-month stint on this rare DX spot.

Dave, who is Electronics Technical Officer with the Bureau of Meteorology, will be the radio officer for this scientific expedition by the Australian National Antarctic Research Expedition (ANARE) to Heard Island. With the anticipated upturn in propagation on the higher frequencies, Dave should be able to satisfy a big demand that still exists for Heard Island.

With what will be a heavy commitment to his ANARE traffic, it will be appreciated if, when he does come on the air, all those amateurs who have Heard Island confirmed will let others make their contacts. Last time, some—I won't call them true DXers—didn't do this although they had up to six contacts in their logs. I feel sure Dave would rather spend what precious time he has for amateur radio giving the little guy a go, instead of pandering to the ego trips of so-called "big guns."

Dave Shaw VK3DHF/VK0HI with Father Noel VK3EVN.

QSLing. This is borne out by Dave's QSLing arrangements. Dave's father, Noel VK3EVN, has taken on the unenviable job of being QSL Manager: Mr. Noel Shaw, 64 Orana Drive, Watsonia, 3087, Victoria, Australia. QSL cards for the operation will be subject to the usual transfer via amateur modes, given propagation, if not, due to poor propagation, a delay until Dave's original logs are landed back into Australia may be necessary—so please do not expect your card via return mail, as Heard Island is one of the remotest places on Earth.

Dave has requested that, for Australian cards, an SASE will suffice, but due to the high cost of overseas postage from Australia, *two IRCs plus a self-addressed envelope* are requested. Personally, I feel this is quite a modest request as it will do no more than cover postage, and none of the cost of the thousands of cards this operation will generate, particularly SWLs via the bureau from one area of Europe.

This approach is a far cry from the few rip-off merchants who now seem to abuse a DX situation within amateur radio.

Operating Frequencies. Dave's preferred mode of operating is to stay away from nets and to operate as an independent operator. He will be on the usual DX frequencies of 80, 40, 20, and 15 meters, plus our Novice section, 21,195 MHz. His antennas will consist of dipoles, using moderate power from his transceivers. He should still put out a good signal worldwide from his location.

It also is envisioned that Dave will have six meters available with a keyer on 52,170 from his shack, using a TS660 plus amplifier. This equipment has been loaned by Gil VK3AUI. Other equipment has been loaned by the VK6 gang.

VK6FS AWARD

Speaking of VBK6, Hugh—VK6F(lying)S(aucers)—one of the original organizers of Dave's last expedition to Heard Island became an SK after the expedition returned to VK. He had the distinction of being the first into the log os VK0HI on Dave's last expedition. To honour his memory, the VK6 Division of the WIA, with a bequest of a small sum of money by Hugh, has created a DX achiever's award. I feel it would be fitting if Dave was to be the first to achieve this award, in Hugh's memory, not only for what he has done for the world's DX fraternity, but for his attitude of giving the disadvantaged DXer a chance to work a rare one, and his nonprofit approach to amateur radio—a refreshing approach and one within the true spirit of amateur radio.

NETHERLANDS

Jos. A. Stierhout PA0VDZ
PO Box 265
6950 AG Dieren-NL

The Netherlands

[Slow but certain: In June we wrote a note to Jos in the International section (under "Notes from FN42, of course) which he received in August, and here is his response. Will he want to be a regular correspondent? Watch this space for up-to-date news only a month or so old.—Ed.]

In Holland we have a population of about 14.5 million and about 15,000 amateurs with the A, B, C, or D license. Every year the VRZA (the Netherlands ham amateur society) organizes a big Radio Campingweek in the most wooded part of Holland: Laag-Soeren, near Arnhem—well-known by soldiers in WWII. It is always held during the week of Ascension Day—so it was May 23-30 in 1987.

The "Jutberg" is a big camping and holiday park with many facilities. This year we had more than 100 calls plus their families, with caravans, tents, campers, and in about 40 bungalows. Fox-huntings and sputnik (a very small transmitter with only *bleep-bleep* signals) huntings on 3.5, 144, and 432 MHz were popular. There were a total of 17, for OMs, (X)YLs, and QRPs. There were specialities for the different days: Sunday, a puzzle-walk through the beautiful woods for the whole family and visitors, and a "Ladies Cafe" in the evening for XYLs

only. Tuesday: for the OMs, an excursion to the biggest cycle factory in Holland, in Dieren, and for the ladies a demonstration and lecture for making Chinese food (Mi-Hoen). That evening everybody was eating Chinese!

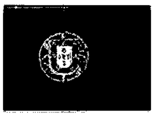
On Wednesday we had another high spot: a barbecue party with a 45-person Big Brassband which later guided a children's procession with Chinese lanterns, and later, dumplings.

Ascension Day itself is always the busiest. We had a flea market, and 1,000–1,500 visiting hams came from everywhere. The General Post-office was there (they are the ones who give the licenses) with a stand from the R.C.D. (Radio Control Service), and a video was shown of their work. They demonstrated filters for avoiding BCI and TVI, and gave a complete computer report of TX and RX from hand-held 2-meter portables. In the evening there was Bingo with $2,000 worth of prizes, such as a Philips computer, donated by many sponsors.

The crowds begin top thin out at this point, and Friday was nearly the end, with a 5-man dance band playing until early Saturday morning. Then there was a goodbye meeting over coffee, and discussions about what to do for the next Amateur Radiocamp in 1988—which will be the 25th camp.

Besides the organization crew, there were two for daily transmissions: one for the daily camping broadcast giving the results of competitions, DX news, weather forecast, etc., and the other for the daily ATV transmissions, showing what the video group had filmed in the camp during the day—with interviews, weather cards, etc. During the whole week, XYLs were making QSOs with the whole world!

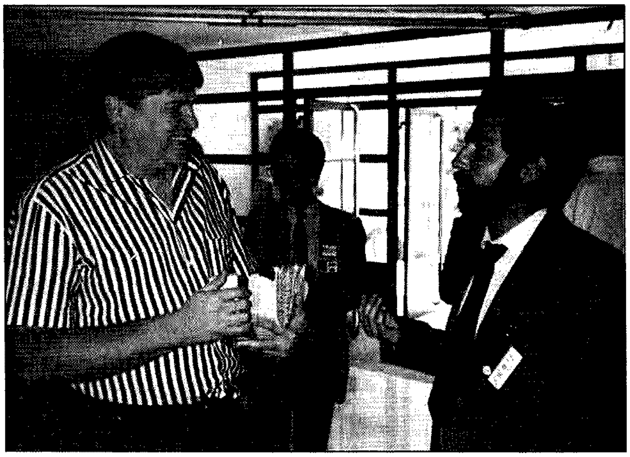
Are you interested in our 1988 plans? Write to me and ask!



PORTUGAL

Luiz Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril 2765
Portugal

EA9 DXpedition. The Lynx DX Group of Spain organized an international DX convention in the Principality of Andorra last May. The group's chairman was Juan



Marti Laine OH2BH (L) and Juan Rosales EA9IE in Andorra. F6EXV in background. (Photo by CT4NH)

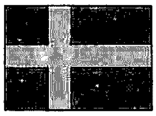
Rosales EA9IE. Among the subject discussed was a proposed DXpedition to the Saharaui Republic (Spanish Sahara—Rio de Oro—EA9land) for which the call will be SØRASD. Details will be announced. Information may be obtained from the Lynx DX Group, PO Box 351, 26080 Logrono, Spain.

New Look for REP. The new board of directors for REP (Rede do Emissores Portugueses) is doing much to give us a whole new look. If you are in Lisbon, do not hesitate to visit this old and interesting club, at Rua D. Pedro V 7, 4th floor (telephone: 36 11 86). A personal computer has been bought for the club; and every Thursday their Radio Bulletin is transmitted on VHF (later on HF) with information about DX, awards, club news, and so on.

CT1AVW is back. Our good friend, Bob Arceneaux CT1AVW (K5ODD in the USA), is back in Lisbon. He works for the American Embassy, and came to replace Don Reibhoff exCT4AT, who died in a tragic accident in Spain. [*See Portugal in the International column for July, 1987.*] Bob has had several nice calls in the past, like 5A4TH—and 5A1TS club station—(1957/58), EL2AC (1963/65), PY1ZAZ (1971/74), and PT2ZAI (1982/86).

We also have another American Embassy friend, Joe Lutz, around; he often uses CR7DKG for contests. Among several calls, he has been W7ZQV-KG6, KG6AAY, W7LPF-DU2, and 5B4.

(L to R, standing) CT1UA, CT4NH, OH2BH; CT3BM and C31LD in front. (Photo by CT4NH)



SWEDEN

Rune Wande SMØCOP
Frejavagen 10
S–155 00 Nykvarn
Sweden

This continues SMØCOP's report, begun in the November, 1987, issue.

THE SM HAM POPULATION

The total number of ham licenses is a little over 11,000. If you leave out the club stations (SK and SL prefixes), the number of private licenses is 10,400. The 1986 increase was 2%. Sweden has four classes of license: A, B, C, and T. Class A is the highest, with all band/mode privileges and 500-Watt power input. Class T (Technician) is a no-code license for VHF/UHF.

There are thoughts of restructuring this system in order to get a better correspondence with the licensing systems in other European countries. One of the discrepancies is the code requirement. For SM Class A, a code speed of 80 letters/minute (16 wpm) is required, while most other countries require only 60 (12 wpm). The Class B would be discontinued. The remainder would be a Novice Class and an Advanced Class for HF and VHF/UHF, and a no-code Technician license for VHF/UHF.

These thoughts are just in a very early discussion stage, and have come up primarily in order to facilitate the comparison of licenses for the European visitor license according to the CEPT recommendation. The CEPT license was not implemented in Sweden this tourist season, and visiting hams from other European countries had to apply for a regular visitor license as before.

NEW AWARDS PROGRAM

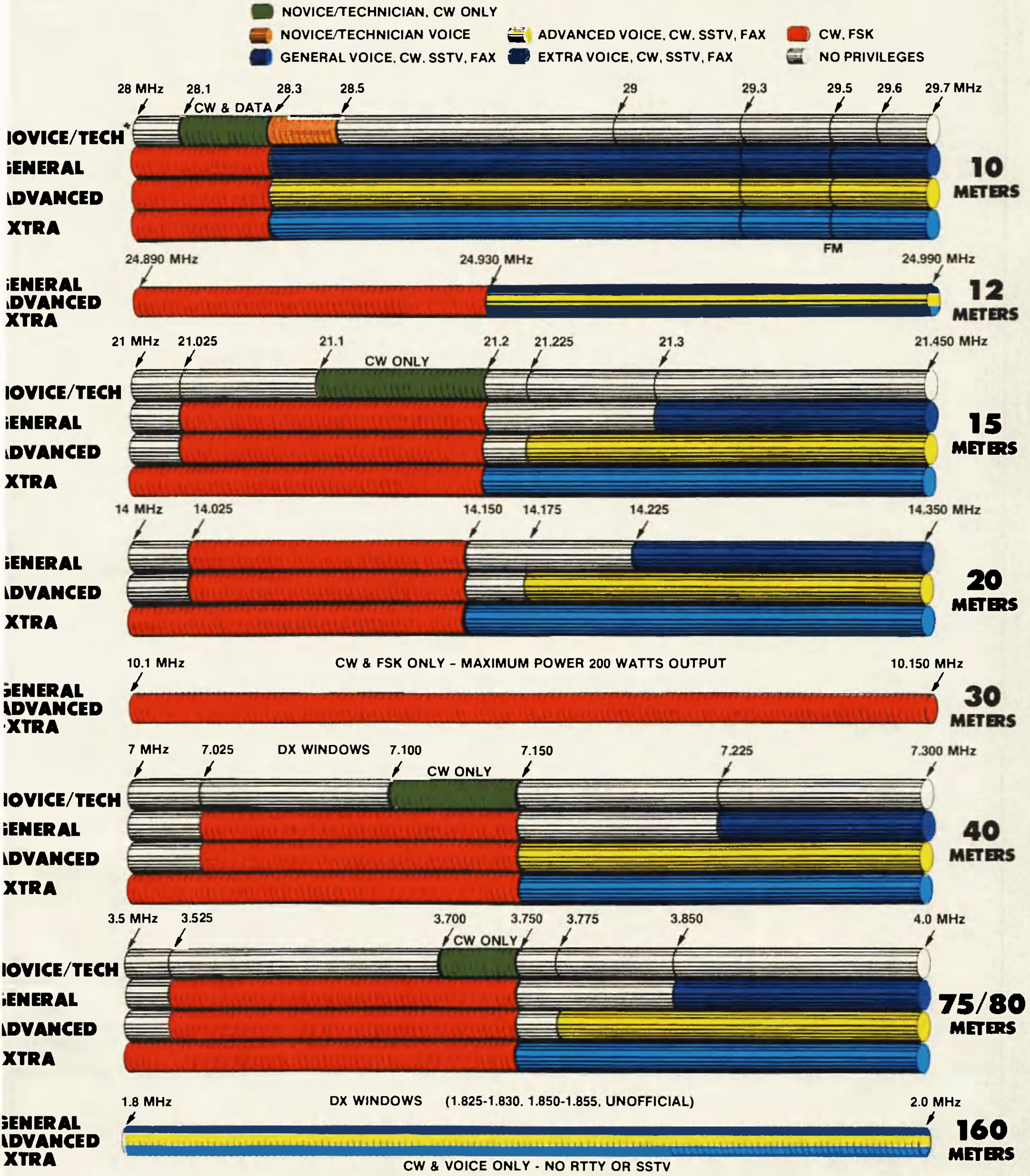
SSA (the Swedish national amateur radio league) has renewed its award program. The new awards of international interest are WASA (worked All Sweden Award), HASA (Heard All Sweden Award), and SLA (Swedish Locator Award). January 1, 1988 is the starting date for these, and in my next column I will give you details.

To give you a fair chance to finish for WASM I and WASM II, the last date for valid contacts for these two awards is December 31, 1989. This means that if you have not started hunting, you can go for both old and new awards during the coming two years! Good luck! 73

ICOM

Amateur Radio HF Band Limits

Developed by Gordon West, WB6NOA, Radio School, Inc., for exclusive use by ICOM America Inc. February 1987



*New Novice/Technician 10 meter voice and digital privileges effective March 21, 1987.

PREFIX	COUNTRY	PREFIX	COUNTRY	PREFIX	COUNTRY	PREFIX	COUNTRY
A2	Botswana	HQ-HR	Honduras	T5	Somalia	YT-YU, YZ	Yugoslavia
A3	Tonga	HS	Thailand	T7	San Marino	YV-YY	Venezuela
A4	Oman	HV	Vatican	TA-TC	Turkey	YVØ	Aves Is
A5	Bhutan	HZ	Saudi Arabia	TF	Iceland	Z2	Zimbabwe
A6	United Arab Emirates	I	Italy	TG, TD	Guatemala	ZA	Albania
A7	Qatar	ISØ, IMØ	Sardinia	TI, TE	Costa Rica	ZB2	Gibraltar
A9	Bahrain	J2	Djibouti	TI9	Cocos Is.	ZC4	UK Sov Base on Cypress
AP-AS	Pakistan	J3	Grenada & Dep	TJ	Cameroon	ZD7	St Helena
BV	Taiwan	J5	Guinea-Bissau	TK	Corsica	ZD8	Ascension Is
BY,BT	China	J6	St. Lucia	TL	Central African Republic	ZD9	Tristan da Cunha & Gough Is
C2	Nauru	J7	Dominica	TN	Congo	ZF	Cayman Is
C3	Andorra	J8	St. Vincent & Dep	TR	Gabon	ZK1	So Cook Is
C5	The Gambia	JA-JS	Japan	TT	Chad	ZK1	No Cook Is
C6	Bahamas	JD1	Minami Torishima	TU	Ivory Coast	ZK2	Niue
C8-9	Mozambique	JD1	Ogasawara	TY	Benin	ZK3	Tokelau Is.
CA-E	Chile	JT-JV	Mongolia	TZ	Mali	ZL-ZM	New Zealand
CE9/KC4	Antarctica	JW	Svalbard	UA1, 3, 4, 6	European Russian R.S.F.S.R.	ZL7	Chatham Is
CEØA	Easter Is.	JX	Jan Mayen	UA1	Franz Josef Land	ZL8	Kermadec Is
CEØX	San Felix	JY	Jordan	UA2	Kaliningrad	ZL9	Auckland & Campbell Is.
CEØZ	Juan Fernandez	K, W, N, AA-AK	United States of America	UA8, 9, Ø	Asiatic R.S.F.S.R.	ZP	Paraguay
CM, CO	Cuba	KC6 (E. Caroline Is.)	Micronesia	UB, UT, UY	Ukraine	ZR-ZU	South Africa
CN	Morocco	KC6 (W Caroline Is.)	Belau	UC	Byelorussia	ZR2-ZU2	Prince Edward & Marion Is
CP	Bolivia	KG4	Guantanamo Bay	UD	Azerbaijan	ZR3-ZU3	(Namibia) S W Africa
CT	Portugal	KH1	Baker, Howland	UF	Georgia	1AØ	Sov Mil Order of Malta
CU, CT2	Azores	KH2	Guam	UG	Armenia	1S	Spratly Is
CT3	Madeira Is.	KH3	Johnston Is	UH	Turkmenistan	3A	Monaco
CV-CX	Uruguay	KH4	Midway Is	UI	Uzbekistan	3B6, 7	Agalega & St. Brandon
CYØ	Sable Is	KH5	Palmyra, Jarvis Is	UJ	Tadzhikistan	3B8	Mauritius
CYØ	St Paul Is.	KH5K	Kingman Reef	UL	Kazakhstan	3B9	Rodriquez Is
D2, 3	Angola	KH6	Hawaiian Is	UM	Kirghizia	3C	Equatorial Guinea
D4	Cape Verde	KH7	Kure Is	UO	Moldavia	3CØ	Pagalu Is
D6	Comoros	KH8	American Samoa	UP	Lithuania	3D2	Fiji Is
DA-DL	Fed Rep of Germany	KH9	Wake Is	UQ	Latvia	3D6	Swaziland
DU-DZ	Philippines	KHØ	Mariana Is.	UR	Estonia	3V	Tunisia
EA-EH	Spain	KL7	Alaska	V2	Antigua, Barbuda	3W, XV	Vietnam
EA6-EH6	Balearic Is.	KP1	Navassa Is	V3	Belize	3X	Guinea
EA8-EH8	Canary Is	KP2	Virgin Is	V4	St. Christopher & Nevis	3Y	Bouvet
EA9-EH9	Ceuta and Melilla	KP4	Puerto Rico	V8	Brunei	3Y	Peter I Is
EI-EJ	Ireland	KP5	Desecheo Is	VE, VO, VY	Canada	4P-4S	Sri Lanka
EL	Liberia	KX6	Marshall Is.	VK	Australia	4U	I T U Geneva
EP-EQ	Iran	LA-LN	Norway	VK	Lord Howe Is	4U	Hdqtrs, United Nations
ET	Ethiopia	LO-LW	Argentina	VK9	Willis Is	4W	Yemen
F	France	LX	Luxembourg	VK9	Christmas Is.	4X, 4Z	Israel
FT8W	Crozet	LZ	Bulgaria	VK9	Cocos-Keeling Is	5A	Libya
FT8X	Kerguelen Is.	OA-OC	Peru	VK9	Mellish Reef	5B	Cyprus
FB8Z	Amsterdam & St. Paul Is	OD	Lebanon	VK9	Norfolk Is	5H-5I	Tanzania
FG	Guadeloupe	OE	Austria	VKØ	Heard Is	5N-5O	Nigeria
FG, FS	Saint Martin	OF-OI	Finland	VKØ	Macquarie Is.	5R-5S	Madagascar
FH	Mayotte	OHØ	Aland Is	VP2E	Anguilla	5T	Mauritania
FK	New Caledonia	OJØ	Market Reef	VP2M	Montserrat	5U	Niger
FM	Martinique	OK-OM	Czechoslovakia	VP2V	Brit. Virgin Is	5V	Togo
FO	Clipperton Is	ON-OT	Belgium	VP5	Turks & Caicos Is	5W	Western Samoa
FO	French Polynesia	OX	Greenland	VP8	Falkland Is	5X	Uganda
FP	St Pierre & Miquelon	OY	Faroe Is	VP8, LU	South Georgia Is	5Y-5Z	Kenya
FR/G	Glorioso Is.	OZ	Denmark	VP8, LU	South Orkney Is	6V-6W	Senegal
FR/J, E	Juan de Nova, Europa	P2	Papua New Guinea	VP8, LU	South Sandwich Is	6Y	Jamaica
FR	Reunion	PA-PI	Netherlands	VP8LU, CE9, HFØ, 4K1	South Shetland Is	7O	People's Dem Rep. of Yemen
FR T	Tromelin	PJ2-4, P4	Neth. Antilles	VP9	Bermuda	7P	Lesotho
FW	Wallis & Futuna Is	PJ5-8	St Maarten, Saba, St Eustatius	VQ9	Chagos	7Q	Malawi
FY	French Guiana	PP-PY	Brazil	VR6	Pitcairn Is	7T-7Y	Algeria
G	England	PPØ-PYØ	Fernando de Noronha	VS6	Hong Kong	8P	Barbados
GD	Isle of Man	PPØ-PYØ	St. Peter & St Paul Rocks	VU	India	8Q	Maldive Is
GI	Northern Ireland	PPØ-PYØ	Trinidade & Martin Vaz Is	VU	Andaman & Nicobar Is	8R	Guyana
GJ	Jersey	PZ	Suriname	VU	Laccadive Is	9G	Ghana
GM	Scotland	S2	Bangladesh	XA-XI	Mexico	9H	Malta
GU	Guernsey & Dep.	S7	Seychelles	XA4-XI4	Revilla Gigedo	9I-9J	Zambia
GW	Wales	S9	Sao Tome & Principe	XT	Burkina Faso	9K	Kuwait
H4	Solomon Is	SA-SM	Sweden	XU	Kampuchea	9L	Sierra Leone
HA, HG	Hungary	SN-SR	Poland	XW	Laos	9M2, 4	West Malaysia
HB	Switzerland	ST	Sudan	XX9	Macao	9M6, 8	East Malaysia
HBØ	Liechtenstein	STØ	Southern Sudan	XY-XZ	Burma	9N	Nepal
HC-HD	Ecuador	SU	Egypt	Y2-9	German Dem. Rep	9Q-9T	Zaire
HC8-HD8	Galapagos Is.	SV-SZ	Greece	YA	Afghanistan	9U	Burundi
HH	Haiti	SV/A	Mount Athos	YB-YH	Indonesia	9V	Singapore
HI	Dominican Republic	SV5	Crete	YI	Iraq	9X	Rwanda
HJ-KH	Colombia	SV9	Dodecanese	YJ	Vanuatu	9Y-9Z	Trinidad & Tobago
HKØ	Malpelo Is.	T2	Tuvalu	YK	Syria	J2/A	Abu Ail, Jabal al Tair
HKØ	San Andreas & Providencia	T3Ø	W. Kiribati (Gilbert & Ocn Is.)	YN	Nicaragua		
HL	Korea	T31	C. Kiribati (Brit. Phoenix Is)	YO-YR	Romania		
HO-HP	Panama	T32	East Kiribati (Line Is)	YS	El Salvador		

Dx

Number 22 on your Feedback card

Hams Around the World

Chod Harris VP2ML
PO Box 4881
Santa Rosa CA 95402

THE DX YEAR IN REVIEW

DX and DXers excelled in 1987. Low-band propagation was the best in years, especially on 160 meters. As expected at the bottom of the sunspot cycle, low level solar activity and a minimum of solar-generated noise kept long-haul propagation on 160 meters well above average. Even the usually-difficult polar path opened wide several days a week during the winter months. ON4UN made good use of the conditions on 160 meters (and the new 160 meter allocation in Belgium) to work more than 100 countries on the band in the first few weeks of 1987! The same low absorption and good polar propagation helped 40 and 80 meters as well, and many DXers added to their band-countries totals in 1987.

The higher bands were remarkably good, considering that we were at a solar minimum. Twenty meters often stayed open well past local sunset, and the low absorption permitted lots of long-haul QSOs. Russian signals poured over the North Pole for much of the year to the delight of oblast chasers. Fifteen meters opened occasionally with good signals on east-west paths as well as the easier north-south paths. Even 10 meters opened between the East Coast and Europe and between the West Coast and Japan a few days of the year. This will soon occur daily. Evidence mounted all year that Sunspot Cycle 22 began in September 1986.

A Boost for Awards

The DX Century Club Golden Jubilee was an enormous success. Thousands of DXers worldwide applied for the handsome award. Pileups were fierce at the beginning of the year. DXers raced to work the easy countries all over again. Although the concept of a "fresh start" for DXCC won little support, DXers didn't hesitate to "start over" for the Golden Jubilee award. The award spurred some interesting competitions, as DXers defined their own version of the award. Some aimed for working 100 countries in the shortest time, such as W6GO, who worked country #100 at 0042Z on Jan. 3, just over 48 hours into the new year. Other DXers set their other goals, such as QRP or single band. A few dozen dedicated DXers earned DXCC Golden Jubilee Times 2, by working more than 200 countries in 1987! More than 280 of the 317 DXCC countries were on the air in 1987.

A host of active resident (or long-term visitors) boosted DXers' country totals resident (or long-term visitor) operators. The best example of this is China, which was the Most Wanted country in the world as recently as 1980. More than a dozen active BY stations, and good polar propagation, put BY in thousands of logs. 5A0A in Libya was the most workable 5A station in years, and 7J1ACH on Minami Torishima made more than 20,000 QSOs in 1987. Other active rare stations included 9N1MM in Nepal, VK0GC on Macquarie Island, ZL8HV on Raoul Island in the Kermadecs, JX9CAA on Jan Mayen, SP5EXA/JW on Spitsbergen, and FT8ZA and FT8XA in the French Antarctic countries.

The Year of The DXpedition

If a single word characterizes DX in 1987, it is DXpedition. Dozens of well-organized and well-run DXpeditions made hundreds of thousands of contacts with deserving DXers worldwide.

The highlight of the year was, of course, the Peter 1 Island DXpedition by 3Y1EE (LA1EE) and 3Y2GV (LA2GV). Einer and Kare braved isolation, sub-zero temperatures, limited food, and enormous pile-ups, to put Peter 1 on for the first time ever. The pair made more than 15,000 contacts on all bands and modes, while operating almost non-stop. Kare actually fell asleep at the rig on more than one occasion. That's dedication!

Photo A. Martha WN4FVU and Carl WB4ZNH Henson were among the 4M0ARV Aves Island DXpeditioners.

The Aves Island 4M0ARV trip, and the Revillagigedo XF4DX DXpedition were also highly successful DXpeditions. Miss Bharathi VU2RBI led about two dozen Indian amateurs to the Andamans VU4. She worked 15,000 DXers herself during her 45-day stay. The Greeks finally managed to activate Mount Athos SY for the first time since the early 1980s.

Many small groups and individual DXers showed that DXpeditions don't have to involve dozens of amateurs, nor cost tens of thousands of dollars. Bob Winn W5KNE and Jim Smith VK9NS opened Cocos-Keeling VK9Y and were followed by a host of others. Jim went on to Christmas Island VK9X, to the delight of many DXers. Some of the Reunion Island hams put the tough French African islands on the air: Tromelin, Juan de Nova, and Glorioso. And, of course, The Colvins—Lloyd W6KG and Iris W6QL—spent the winter operating from that same region. Wallis Island VK9W, Cocos TI9, and Heard VK/0, were all active in 1987, thanks to DXpeditioners. Brazilian amateurs managed to activate all three PY0 islands in 1987: St. Peter and St. Paul Rocks, Trindade, and Fernando de Noronha. Even the Russians got into the act with numerous DXpeditions to rare oblasts throughout the country.

There were a few flies in the DXer's ointment in 1987. Two ground-breakers in DX are now Silent Keys: Don Reibhoff K7ZZ and Joe Ahumada LU2DX. Don was a mainstay from Southeast Asia in the '60s and '70s, and successfully promoted amateur radio throughout the region. Joe was a pioneer DXpeditioner in the 1950s, paving the way for hundreds of others in later years. They will be sorely missed. Iris Colvin slipped and broke her hip in the Maldive Islands, but was up and around at Visalia and Dayton. She is off again with Lloyd on their annual multi-country DXpedition.

Photo B. Japan DX News editor JR1AIB (left) greets 1987 DXpeditioners Einer LA1EE/3Y1EE, Miss Bharathi VU2RBI/VU4APR, and Mr. Suri VU2MY/VU4APR.

The Outlook for 1988

The DX outlook for 1988 is very favorable. Sunspots will swing back quickly to bless DXers with good 15-, 12-, and 10-meter openings. Twenty should provide DX possibilities most of the day and night. The low bands should be fair to good in 1988, before increasing solar activities raises the noise level too much. Several major DXpeditions are in the planning stages for 1988, and even if just a few of them come off, it will be another good year for DXers! Look for Bouvet 3Y, Vietnam XV, Spratly 1S, Andamans VU4, South Sandwich and South Georgia VP8, Marion Island ZS8, Laccadives VU7, and others next year.

DXers can keep up to date on current happenings in DX by subscribing to one of the weekly DX newsletters. To help at least one reader of this column improve his or her DX score in 1988, I will give away a free one-year subscription to The DX Bulletin Just send your name, call, and address (or a QSL card) to P.O. Box 4881, Santa Rosa CA 95402, before the end of 1987. On January 1, 1988, I'll pull one card out of my hat, and send that lucky DXer a free subscription. Good DXing in 1988!

Number 2 on your Feedback card

Bob Heil K9EID
Heil Boulevard
Marissa IL 62257

Remote Base Control

Work DX from your HT!

During the past few years, the cost of commercial VHF and UHF FM equipment for the amateur market has dropped radically. This fact, coupled with the popularity of small hand-held transceivers, has led many amateurs into building remote-base systems, which can increase the range of a hand-held from a few miles to hundreds or even thousands of miles.

What Is a Remote Base?

A remote base is not a repeater, although the two are similar. A remote-base system (RBS) usually consists of two transceivers operating in a crossband-linked mode, as shown in Fig. 1. One of the linked stations has *complete* control over the link operation. This control station turns the link on and off and performs other control functions over the air.

In contrast, a repeater *cannot* be controlled on the input frequency. The frequencies used for a remote base are not important, except that the controlling station must operate at or above 220.5 MHz and only unoccupied simplex channels should be used (to prevent QRM to repeaters and other simplex users).[1]

A remote-base system can effectively turn a portable QRP transceiver into a high-power base station with high antenna gain. Many remotes use 10-meter equipment located on a mountaintop or tall building and control this remote with a UHF or VHF link; DX stations can be worked from a hand-held or mobile station using this setup. At W9GOE/R in Marissa, Illinois, a remote 10-meter FM system is linked on 220 MHz to the 2-meter repeater, allowing the 2-meter users to enjoy the fun and thrill of working DX through the 2-meter repeater.

Build a Simple Remote Base

Interconnection of two transceivers for remote-base operation is simple and can be accomplished without a lot of sophisticated control and audio interface circuitry. Refer to Fig. 1. The squelch circuit of transceiver A activates the PTT line of transceiver B. At the same time, speaker audio is applied to the microphone input. This is basically how a repeater operates, but, in an RBS, the repeating process is reversible. The squelch circuit of transceiver B controls the PTT line of transceiver A, and so on.

Finding the proper control voltage in the squelch circuit of each transceiver is perhaps the most difficult task in building the remote base. Many of the newer radios have an LED to indicate signal presence (open squelch). Usually, a one-transistor switch in the squelch circuit supplies positive voltage for the LED. This positive voltage can control the circuits in the remote-base interface. Fig. 2 is the schematic diagram of the simple remote-base T-R control interface for transceivers using either positive-voltage (active high) or negative-voltage (active low) squelch circuits.

Audio coupling between transceivers is achieved by connecting the speaker output of one unit through a limiting and pre-emphasis network to the microphone input of the other. Microphone output levels are on the order of 50 uV and a speaker output may provide 2 or 3 volts, so an attenuator potentiometer must be used. A 4.7-kilohm resistor and a 0.004-uF capacitor provide proper audio shaping. Fig. 3 shows a typical circuit.

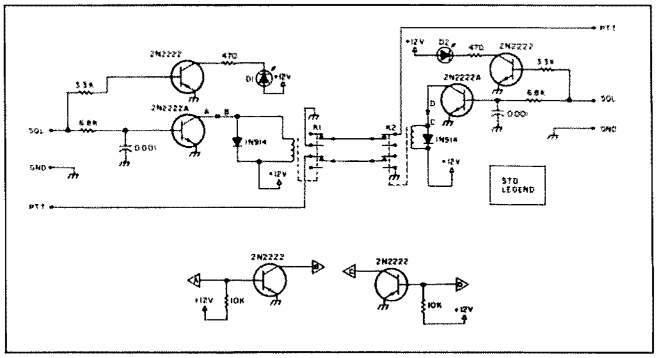


Fig. 2. Schematic diagram of the remote-base control interface. Use the circuit shown in A for transceivers that provide an "active high" from the squelch circuit; insert the components shown in B at points A, B, C, and D for "active low" squelch circuits (D1, D2—red light-emitting diodes; K1, K2—DPDT relays, 12-V coil, 2-A contacts).

Testing

Once the circuits are wired and the transceivers are connected, testing of the circuit is simple. Rotate the squelch control of transceiver A until white noise is heard. This should activate the PTT line on transceiver B; white noise should be heard in a third receiver tuned to output frequency B. Adjust the level-control potentiometer for proper deviation. Rotate the transceiver A squelch control back to the "quiet" position and repeat the same tests for transceiver B.

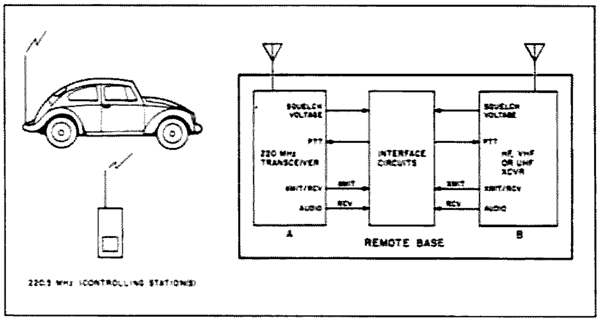


Fig. 1. Block diagram of the remote-base system.

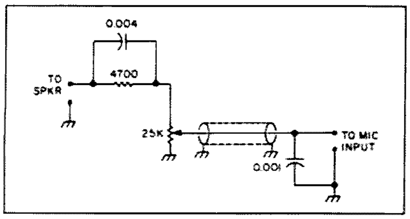


Fig. 3. Schematic diagram of the remote-base audio circuitry. This circuit must be duplicated to interface each transceiver.

Other Thoughts

Many types of control circuitry can be added to the remote base to provide nice features. Why not use a DTMF (dual-tone multi-frequency) pad and associated decoder to change the remote-base frequencies? Should you really get carried away, you could even build circuits that would remotely turn a directional antenna.

"A remote base is not a repeater."

The new series of HF rigs (TS-430S, IC-740), which have active squelch circuits that operate on SSB signals, allow the remote-base control to be used between the VHF or UHF control frequency and any of the HF bands. This allows you to move around freely with a rubber ducky/HT on VHF talking on 20 or 40 meters, let's say. It is truly talking to the world with your rubber ducky!

All that is necessary is to find the point in the HF rig where that squelch circuit raises a voltage potential from 0 to 3–4 volts DC when a signal is received.

The success and fun of an RBS is limited only by the imagination and skill of the builder. Why not grab a soldering iron and build yourself a system? It *will* pique your interest in VHF FM!

References

1. See FCC regulations, Part 97.61(d).
2. Parts for the remote-base system are available from Heil Sound, Ltd., No. 2 Heil Drive, Marissa IL 62257.

Bob K9EID, founder of Heil Sound, Ltd., was a pioneer in VHF and UHF work in the early '60s. He was named Ham of the Year at Dayton in 1982 for attracting young people into ham radio.

1987 INDEX

HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free, on a space available basis. To make our job easier and to ensure your listing is correct, please type or print your request clearly on a full (8½ x 11) sheet of paper. Double space and use upper and lower case letters where appropriate. Also, write numbers carefully—a 1, for example, can be read as an l or an i or a 7. Thanks.

I am looking for a code practice program for my CoCo (Radio Shack's color computer).

Brandon Armstrong
635 Chamberlain #8
El Cajon CA 92020

I am looking for modifications, additions, and improvements for the HAL ST-6 Teletype converter. Also, need manual and schematic for TS-888 Teletype test set.

Marvin Moss W4UXJ
P.O. Box 28601
Atlanta GA 30358

Need service info for the following. I will purchase or pay copy cost. Unicom Electronics Power Supply Model Ps-11R, Tandy 64K Color Computer II Model 26-3127, EMP/GTS Manual Mini Modem Model MM-101 (manufactured by Elec and Johnson Messenger CD Model 323, Apple IIe Pro System Duo-Disk, Imagewriter, Printer Monitor II, ICOM Model 735 Ham Transceiver, Loonam Assoc. Modem Model FM30, Designers for Industry Mutual Conductance Tube Tester Model TV2CU (F.A.A.), Amplifier/ Marker Jerrold Model CM-6C (F.A.A.), Signal Generator URM-64A/TS-419, and RCA Video Disc Player Model SGT-250.

Need the following. Please state price and/or condition in correspondence. Two (2) Transistors MRF 455 A; Five (5) Tubes 7868; Ten (10) lamps #12 6V for Bogen PA Amps; One (1) Each Bandswitch for Panasonic rF 2800 Receiver #RSR 98W or Equivalent; One (1) Printer and Disk Drive for the Tandy Color Computer II Model 26-3127 and One(1) each Z-80/CPM for the Apple IIe Pro System.

Mike Adams
Haney Vo-Tech Center
3016 Hwy 77
Panama City FL 32405

I need schematic and service info for a Tektronics model 502 Oscilloscope. Will gladly pay copying and mailing costs.

Gordon Fulp
4740 Scotch Pine Lane
Placerville CA 95667

Can anyone supply a photostat or other copy of the Electronics Illustrated article (circa 1970) that dealt with the schematic and power supply for the micro oscilloscope featured in the January 1970 issue.

Randy White KB4ALH
506 Robinhood Dr.
Seneca SC 29678

I am seeking schematic and alignment data for a National NC-109 Communications Receiver. First submission gets payment, if not prohibitive. Submit proposal.

Lloyd Williams KA0ZCY
RR 1, P.O. Box 248
Baxter Springs KS 66713

I am looking for a manual or schematic for COMMERCIAL TRADES INSTITUTE SC 36 Scope. Needs a transformer.

Jim Wisdom K4HCG
3308 Cobblestone Ct.
Raleigh NC 27607

I am looking for other people who have built the project found in the May '80 issue of *73*, called "The Beachside 2-Meter Beam" (p. 132). I've built it, but have tried everything without success to get rid of the high SWR, and to even get some range on it. Please share your success tips with me.

Dick Wolf N8IHN
1890 Big Trail Rd.
Walled Lake MI 48088

I am looking for a manual or any information on a Gonset G-150 Business Communicator. It appears to be a single channel VHF transceiver, but I have no x-stal information. Would gladly pay costs for copying manual, or would make copy of your original and return. Thanks and 73's.

Daron Wilson N7HQR
P.O. Box 714
Toledo, OR 97391

EICO 470 o'scope power transformer needed. Anyone out there have a junker scope with a good transformer? Send price to:

Pete Haas
P.O. Box 702
Kent, Ohio 44240

I'm looking for a manual/schematic/calibration procedure for a Boonton RF Voltmeter, Model 91CA. Also a manual/schematic for a Realistic DX-150-B receiver.

James W. Lee
WB4GWX/AAV6UX
5004 Ridge View Court
No. Richland Hills, TX
76180-2521